

Radio Fun

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"The beginner's guide to the exciting world of amateur radio."

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New Format

We will be changing the format of *Radio Fun*, beginning with the August 1995 issue.

You will receive a smaller size magazine, similar to that of our sister publication 73.

The end result should be an easier-to-handle magazine that is more readable, and simpler to file.

"Daddy," she said, "I want to get my license."

Oklahoma Bombing

The April 19th bombing of the federal building in Oklahoma City, Oklahoma, shocked Americans like no event has ever before. The heavy loss of life, 168 people, and the emotional rescue effort drew worldwide attention. Among the people helping put lives and affairs back in order after the blast were amateur radio operators. We have a special report on the role hams played after the bombing.

Oklahoma is used to dealing with tornados and severe thunderstorms. For amateur radio operators in the state, emergency communications usually means operating nets to assist with severe weather spotting and damage recovery. But April 19th brought a new sense of reality and a new sense of understanding about what disaster can mean. While Americans stared in disbelief at the live video of flames, damage, and crying children being carried by fire fighters, Oklahoma hams didn't wait for someone to ask for help.

"I would say it was self-activation. A lot of people heard the explosion," stated Tom Webb WA9AFM, who is the ARRL Public Information Officer in Oklahoma.

"A lot of our local hams tend to monitor 22/82, which is the primary frequency. Essentially everyone realized something was wrong and monitored. Once we received official word, which was about 15 to 20 minutes after the blast, we officially activated the local ARES Net and continued to operate continuously for about 330 hours," added Webb.

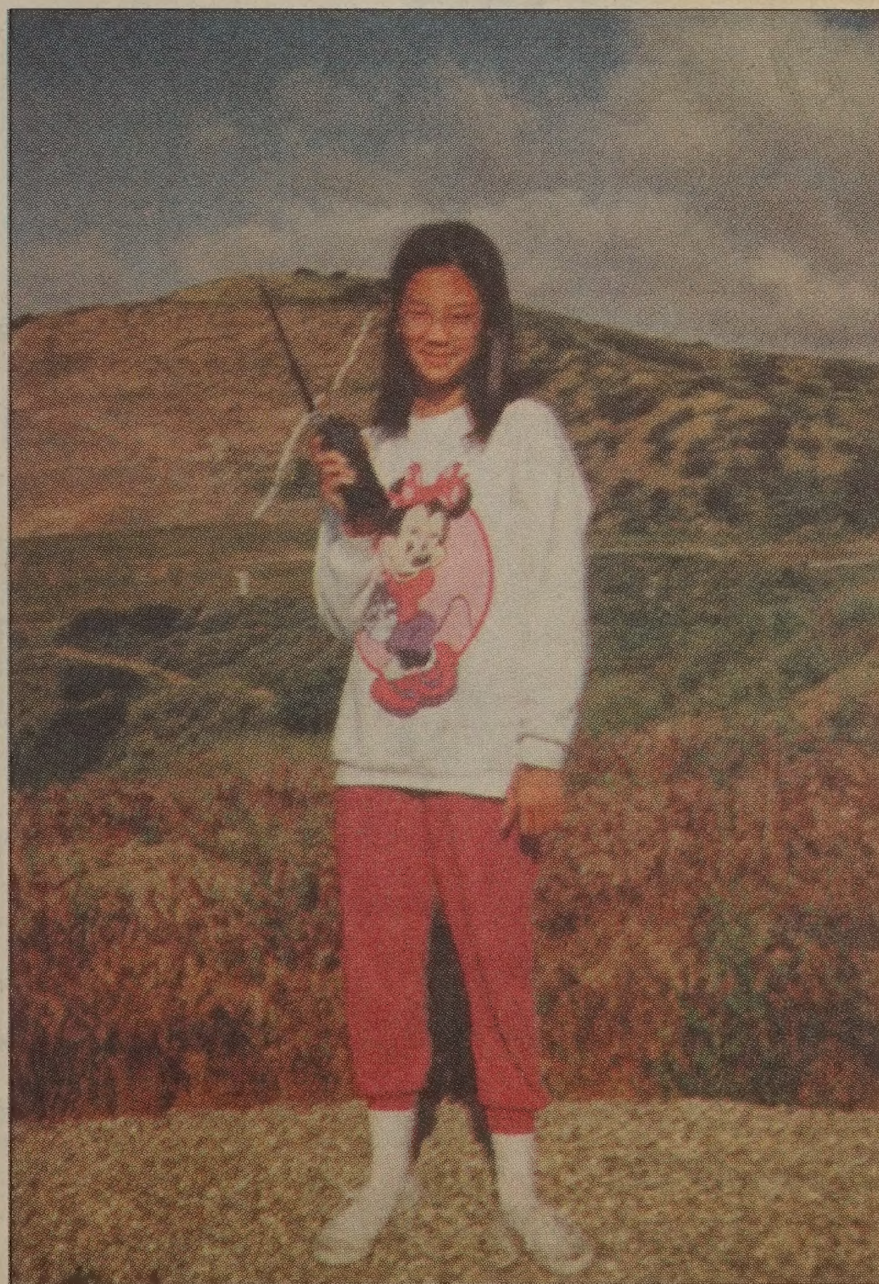
In all, nearly 335 hams provided some sort of communications assistance. Hams responded from Kansas and Texas. And there was plenty of need for what amateur radio could provide.

Webb said, "We fanned out to various hospitals, this was in accordance with the catastrophic disaster plan that was already in place and which had been practiced frequently in the past. Hams were stationed in the emergency rooms at the various regional hospitals around the city coordinating casualty evacuation, supply transfers, and so on.

After that phase was over we moved into our support phase where we were assigned to the various Salvation Army canteens, warehouses, and state emergency command posts to coordinate the moving of supplies. Although our original function was to provide emergency communication, it fell to us also to provide drivers because of limited access to the area, it being in fact a crime scene. Hams who had such vehicles as pickup trucks, suburbans, and vans also were assigned to move a lot of supplies to the various areas," Webb explained.

Even in the heart of downtown, where cellular telephone service was available, there were communications problems only amateur radio could overcome.

And that's just what she did. With some help from her dad, KN6MG, this determined young lady, Kelly Woo KE6KJU, earned her "ticket." Their story, beginning on page 12, offers practical advice to help you, or someone you know, achieve that same goal.



"In the downtown area, there are quite a few cellular nodes, public service, and commercial radio transceivers," Webb pointed out. "Those were knocked off the air and were therefore useless. And of course initially

there was a tremendous load on the phone circuits, cellular circuits, and also the public service radio. We provided underlying communications that allowed supplies to be ordered

Continued on page 7



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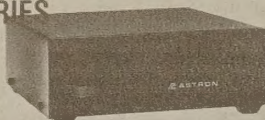
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SL-11R	• •	7	11	2 5/8 x 7 x 9 3/4	12
SL-11S	• •	7	11	2 5/8 x 7 1/2 x 9 3/4	12
SL-11R-RA	• •	7	11	4 3/4 x 7 x 9 3/4	13

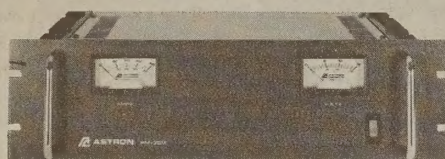
RS-L SERIES



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RS-5L	4	5	3 1/2 x 6 1/2 x 7 1/4	7

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MODEL RM-35M

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RM-35A	25	35	5 1/4 x 19 x 12 1/2	38
RM-50A	37	50	5 1/4 x 19 x 12 1/2	50
RM-60A	50	55	7 x 19 x 12 1/2	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5 1/4 x 19 x 8 1/4	16
RM-35M	25	35	5 1/4 x 19 x 12 1/2	38
RM-50M	37	50	5 1/4 x 19 x 12 1/2	50
RM-60M	50	55	7 x 19 x 12 1/2	60

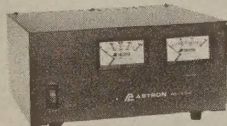
RS-A SERIES



MODEL RS-7A

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-3A	• •	2.5	3	3 x 4 3/4 x 5 3/4	4
RS-4A	• •	3	4	3 3/4 x 6 1/2 x 9	5
RS-5A	• •	4	5	3 1/2 x 6 1/2 x 7 1/4	7
RS-7A	• •	5	7	3 3/4 x 6 1/2 x 9	9
RS-7B	• •	5	7	4 x 7 1/2 x 10 3/4	10
RS-10A	• •	7.5	10	4 x 7 1/2 x 10 3/4	11
RS-12A	• •	9	12	4 1/2 x 8 x 9	13
RS-12B	• •	9	12	4 x 7 1/2 x 10 3/4	13
RS-20A	• •	16	20	5 x 9 x 10 1/2	18
RS-35A	• •	25	35	5 x 11 x 11	27
RS-50A	• •	37	50	6 x 13 3/4 x 11	46
RS-70A	• •	57	70	6 x 13 3/4 x 12 1/2	48

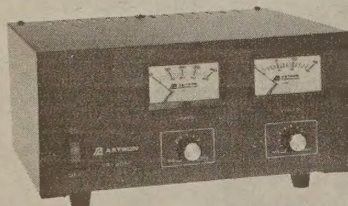
RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4 1/2 x 8 x 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 x 9 x 10 1/2	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 3/4 x 11	46
RS-70M	57	70	6 x 13 3/4 x 12 1/2	48

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MODEL VS-35M

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	@13.8VDC	@10VDC	@5VDC	@13.8V		
VS-12M	9	5	2	12	4 1/2 x 8 x 9	13
VS-20M	16	9	4	20	5 x 9 x 10 1/2	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13 3/4 x 11	46
VS-70M	57	34	16	70	6 x 13 3/4 x 12 1/2	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 1/4 x 19 x 12 1/2	38
VRM-50M	37	22	10	50	5 1/4 x 19 x 12 1/2	50

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-7S	• •	5	7	4 x 7 1/2 x 10 3/4	10
RS-10S	• •	7.5	10	4 x 7 1/2 x 10 3/4	12
RS-12S	• •	9	12	4 1/2 x 8 x 9	13
RS-20S	• •	16	20	5 x 9 x 10 1/2	18
SL-11S	• •	7	11	2 3/4 x 7 1/2 x 9 3/4	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)



QLF

by Wayne Green W2NSD/1

But, Have You Changed, Too?

The efforts of the old-time hams to keep the hobby from changing—to prevent it from keeping up with the changes in technology—are a reflection of the general human resistance to change. So here we are, still forcing all newcomers to the hobby to master the code before we'll let them enjoy our major ham bands. But that isn't what I'm going to try to get you to think about. I've fussed about that stupidity much more than I should.

Technology is changing the world much faster than most people are able to deal with. Here we are, in a world of cellular telephones, satellite communications, small, inexpensive, and incredibly powerful computers, relatively low-cost world transportation, fax machines, and now the Internet and its potential.

These changes—I should call them paradigm shifts—have already heavily impacted the blue-collar workers as their jobs have been replaced by machines/automation and lower-wage workers in other countries. And this is just the start of all that. Middle management has been decimated by technology, too, and they didn't see it coming any more than the blue-collar workers did. Well, they weren't reading my editorials. I don't think much has happened that I didn't predict at least ten years ahead. Check my old editorials if you think I'm exaggerating.

Now is this poor old Uncle Wayne bragging again? Possibly. But my point is that I have a fairly good record of foreseeing the future, so maybe you could do worse than consider that I might just be right again in my predictions. In which case your future success, and even more important, the success of your kids and grandchildren, could be affected by your ignoring my "crystal balling."

"Will you have the education and the skills you need to cope with the technology and transportation mix of 2005?"

Foreign Competition

The production-line workers who are out parading around with signs bemoaning the moving of their jobs to Mexico, the Philippines, Malaysia, and so on, are bewildered. After all, they've been doing the same job for 20 years and getting regular raises. Now, suddenly, with no warning, the factory has closed! No warning? Well, no warning to the illiterate. And I count anyone illiterate who does not read, whether they have acquired the skill or not.

So we've got millions of people who have been totally surprised to be out of work. Not having been aware of the changes coming,

they've made no effort to build skills more relevant to the changing technology. The electronics factories in Asia not only use lower-wage workers, but they are higher skilled because their school systems make ours look like those in the third world. Plus their factories are automated far beyond most of ours. Over 10 years ago, Samsung in Korea was making 13" TV sets by the zillions, with the whole process so automated that there were less than 15 minutes of labor in each set! It's no wonder the American TV manufacturers blew away.

The better-educated and higher-skilled work forces in other countries are gradually taking away our manufacturing industries. We've countered by moving our factories abroad and replacing middle management with computers and better communications systems to cut overhead. Today we have more people working for the government than we do in manufacturing. Of course, if I could get any politicians to listen to my ideas, we could cut the government work force in half within three years, and have the people

involved cooperating enthusiastically. It's in my book.

So what work will you be doing in 10 years? That's 2005, and not very far away. Will you have the education and the skills you need to cope with the technology and transportation mix of 2005? Or will you be blindsided? Remember, the American standard of living has been gradually dropping over the last 20 years, and there's no sign of any change in this trend.

Self-Education

Ham radio provides a wonderful way for you to come to grips with the changes in technology. Of course, if you go the usual

route and refuse to accept the challenges open to you, you'll be able to survive on a 75m net or fighting the pileups on semi-rare DX stations for years without learning one darned thing. Others will open the door to adventure and self-education by going into packet, RTTY, satellites, and so on. That's the first step.

With around 10,000 repeaters around the country, how many do you know of that can cross-band you to 20m or any of the low bands? I had a great signal from my repeater, WR1AAB, on 2m, 6m, and 10m. Switchable, of course. And that was in 1970. Tell me about our progress in repeaters over the last 25 years. I even set up a separate repeater just so I could work 20m DX while I was on my morning "walks" up Mt. Monadnock. I took that one over to Jordan in 1973 and set it up on a hill facing the downtown palace as JY73. It covered Amman nicely.

Have you been playing with slow-scan? Weather satellites? Oh, just rag chewing? I can understand that; with over half of our licensed hams isolated up on the VHF's by their ticket limitations and their terror of learning the code, their horizons are limited. It's easy to get trapped in a pattern of doing nothing, learning nothing, and contributing nothing to society.

On the other hand, it should be obvious to anyone who reads much that the future of amateur radio lies not in working 400 countries or in winning DX contests, but in developing our microwave bands via ham satellites. If we don't, we'll eventually be plowed under by the Internet as it develops, providing cheaper, surer communications anywhere in the world.

Have you considered pushing the FCC to allow digital communication experimenting so we can get started swapping video, music, and voice at high speed? A recent article in *Fortune* showed how Internetters can now exchange voice messages. No QRM either. Anywhere in the world. The system only works on Windows, so I've been forced to get a Windows adapter for my Big Mac. **RF**

Newcomers

by Wayne Green W2NSD/1

This Is Your Last Copy

Well, maybe your next to the last copy, unless you are a paid subscriber. Two issues of *Radio Fun* are free—a sort of "welcome aboard" thing to newly licensed hams. If you are not yet a subscriber, I hope this will trigger you into subscribing, to both *Radio Fun* and 73. This is a fun hobby with all kinds of interesting things to do and learn, but you need a monthly shot of excitement to keep you going.

For the price of a dinner in an average good restaurant (\$30) you can get a year's worth of both publications. This will keep you up with what's going on and help you find out how to get in on the fun thousands of hams are having with the hobby, whether it be sending packet messages or going on a DXpedition to St. Pierre.

You'll also get a load of my editorials. Some people love 'em, and some hate 'em. Some hams will drive hundreds of miles to hear me give a talk at a hamfest. Others mutter unprintables and skip my stuff. My goal, both in publishing my magazines and writing my editorials, is to help you enjoy the things I'm enjoying, to educate, to open new worlds for you, to keep you from being a crummy couch potato, to get you thinking, and perhaps to help you be more successful in life.

The \$30 price for both *Radio Fun* and 73 is to help get you hooked. You really should pay \$39, the regular subscription price. Tell you what, if you find you're really looking forward to each issue, you can lift a tremendous load of guilt from your mind by sending me the extra \$9. Or by ordering my *Declare War* book for \$10 from Uncle Wayne's Bookshelf.

As a new ham I'm assuming that you are intelligent, interested in technology, and adventurous. This is the picture I have of you in my mind as I write my editorials and help Mike Nugent WB8GLQ, our Senior/Technical Editor, pick the articles for us to publish. Sure, we have some serious nut cases (mostly Extra Class Hams, oddly enough), but 99% of my mail is from hams I wish I had the time to meet and make my friends.

You're going to enjoy the columnists I've rounded up to help you have more fun. And to learn more. No fair just rag-chewing and not learning. That's cheating. Cheating yourself most of all. It's fun learning how ham teletype works. It's a ball building something and actually getting it to work! Wait'll you start getting some gorgeous pictures via Clover from Africa. You'll be driving your family and friends to distraction with more beautiful pictures every day from weird places around the world.

It's exciting to get a new piece of ham gear and get on the air with it, whether it's a 1-watt rig built into a matchbox, or a new kilowatt linear. My magazines run circles around the others when it comes to reviewing new equipment. Once you get to know what you are doing, I'd like to see what you can do in reviewing something you've bought. Both of my magazines are written almost 100% by the readers. Like you.

So send me a check for \$30, or call in your credit card number, and let's make sure you won't miss an issue (603-924-0058). Most of the hams I entrap into subscribing keep right on for the rest of their lives. Well, what better amateur radio reference library can you have than a shelf full of 73s? **RF**

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CIRCLE 68 ON READER SERVICE CARD

A PC, CW, and Ham Radio

by Herbert L. Foster AD4UA

Would you like to key your transceiver from your computer's keyboard? Care to key your transceiver with your iambic paddle and see what you're sending printed on your computer's monitor? You just may be sitting on a gold mine without knowing it. That was my position some time ago when I discovered the Terminal application of Windows 3.1.

Using Terminal

To make use of this, you'll need your computer with Windows 3.1 installed, your transceiver, and a memory keyer. I use AEA's Morse Machine MM3. While other keyers may work in this configuration, I can only say that the MM3 does it well. What's required is a way to convert between ASCII, which your computer speaks, and Morse, which your transceiver understands. If your keyer can do this, and if you can run Windows 3.1, you are in business.

First, you'll need to make an interface between your computer's serial port, either COM1 or COM2, and your keyer's Serial In and Serial Out jacks. This is easily done by wiring a DB-25 connector to a pair of

shielded lines. Connect from the DB-25, pin 2 (TXD), via one shielded cable to your keyer's Serial In jack, and also from the DB-25, pin 3 (RXD), via another shielded cable to the keyer's Serial Out jack. You can use ordinary coax, such as RG-8X, RG-59, etc., but this size cable gets a little hard to handle in the confines of a DB-25 hood. Audio shielded lines, such as those found on Radio Shack patch cords, work fine.

Now, fire up your computer (or boot it, as the computer nerds like to say). Get Windows running, and start the Terminal application. It's in the Accessories group. Pull down the menu under Settings, select Communications, and press Enter. You can now set the baud rate for 1200 or 300, and select 8 bits with no parity. Select the COM port you like and click on OK. (See Figures 1 and 2.)

Next, turn on your keyer and transceiver. Adjust the keyer for a rate that you find comfortable for copying, and try keying from your computer's keyboard. You should find your transceiver keying and following what you input from the key-

board. Next, try keying your rig with your paddle and the keyer set for iambic. Your rig should now key as directed by the paddle and the characters sent should appear on your monitor screen. If you have trouble here, try setting up a different baud rate.

More Applications

When you have all of this running to your satisfaction, there are some more goodies hidden in Terminal. In the Terminal window, pull down the Settings menu and click on Show Function Keys. Pull down the Settings menu again and click on Function keys. You'll see a dialogue box showing the eight function keys in Level #1. You can move around the box by clicking the mouse on the desired item and also by pressing Tab. The box will display 32 function keys in four levels of eight keys in each level, one level at a time.

Starting with Level #1, which will be highlighted, Key #1 will also be highlighted in the part headed Key Name. Type in the desired name of the key. For example, type in "CQ" (without the quotes). Move to the next box for Key #1, headed Com-

mand, and type in the text you would like to transmit. For example, type in "CQ" five times, followed by "DE" and finishing with your callsign twice. Include spaces between the CQs and the other parts of the message. (See Figure 3.) Click on OK. Pull down the Settings menu again and click on Show Function Keys. The eight function keys for Level #1 will be displayed along the lower edge of the window. Now, by clicking on Key #1, your rig will start to key and will pump out a nice CQ message. You can include a "K" in your message or add that in by hand, pressing "K" on your keyboard when the Function Key has finished its message. Set up any of the other 32 messages you wish using the same procedure.

You can set up your rig to deliver the sidetone without actually keying, or just run with power turned down into a dummy load, and then send a practice line with your paddle. If you then look at your monitor screen to see what the computer copied, you might be surprised. For example, you might think you sent a "C," but the computer might have read that as "N N." It's a great way to improve your fist.

You can even send a previously composed file, sit back, and watch your computer do all the work. (See Figure 4.)

For more information on Terminal, look into any of the several books on Windows 3.1. RF

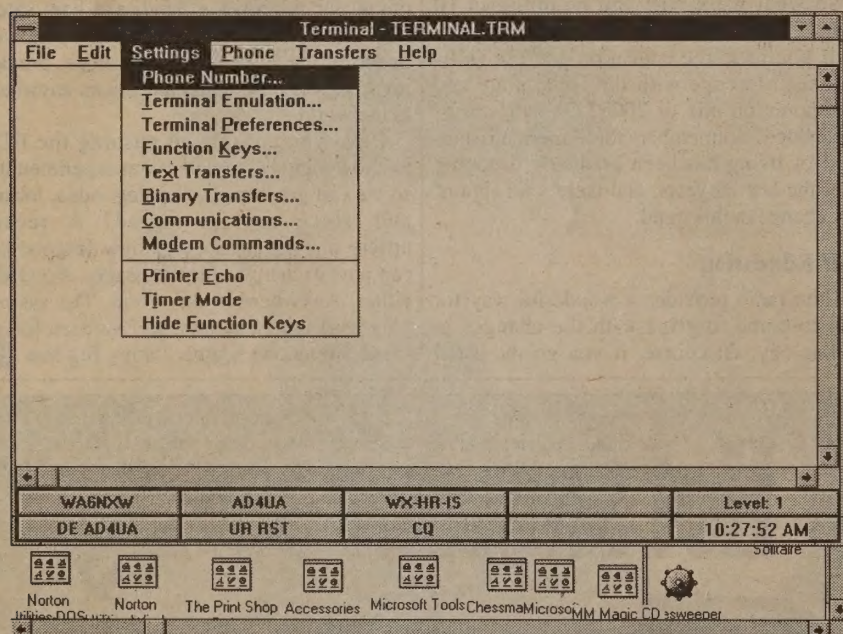


Figure 1. After you open Terminal, go to the Settings menu and select Communications.

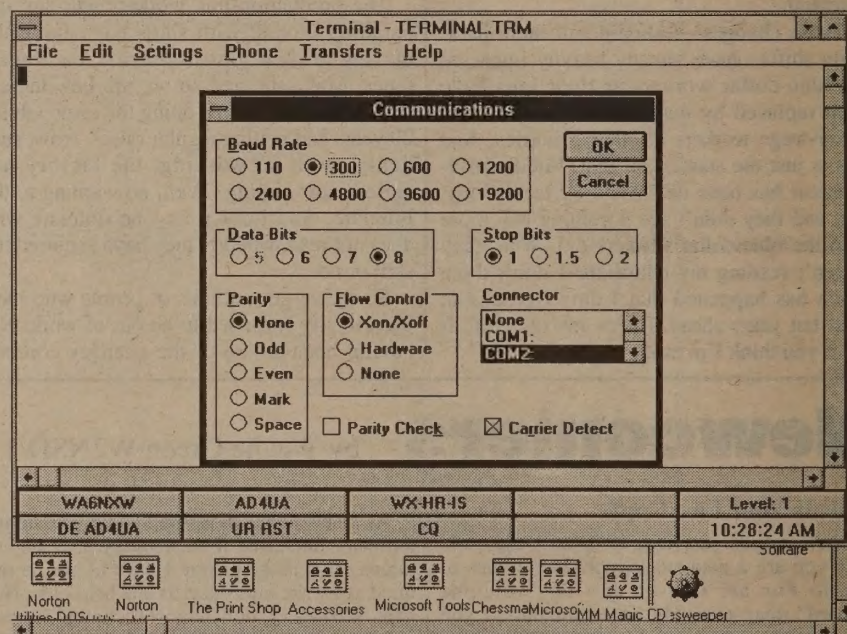


Figure 2. Select 300 or 1200 baud, 8 data bits, 1 stop bit, and no parity, then select your COM port.

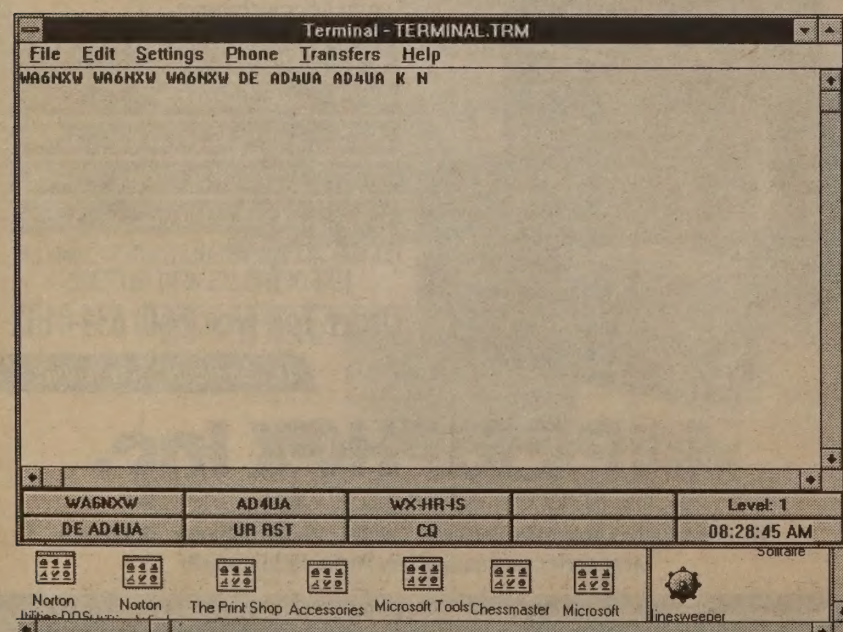


Figure 3. You can configure function keys to automatically send frequently used messages.

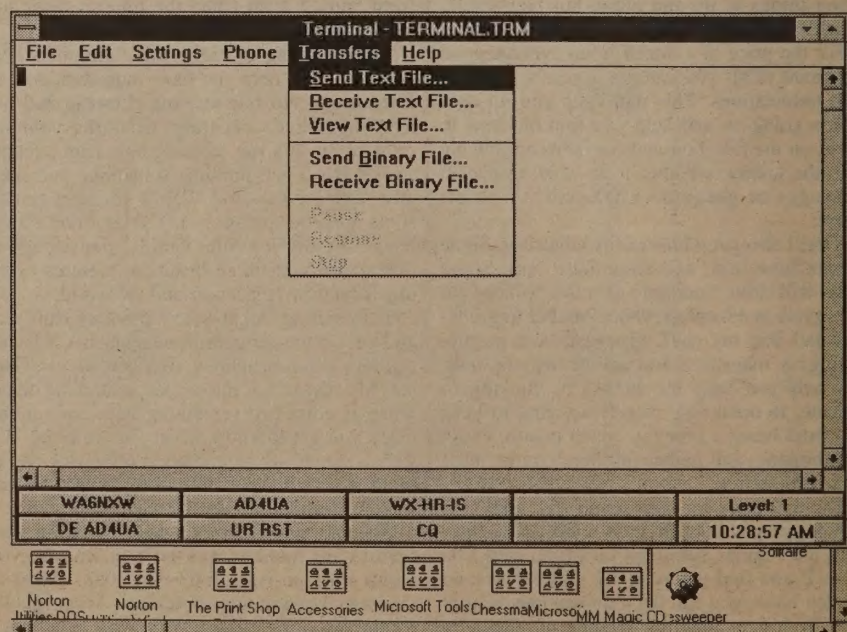


Figure 4. Select Send Text File under Transfers to automatically key previously composed text.

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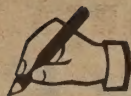
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letters



Write to: Radio Fun, 70 Route 202-N,
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Jim Buchheister N3SAV, College Park MD I'm a new ham busting my hump trying to find the time to pass the 13-wpm code test and still maintain a normal life. I still have to pass the 5 wpm, but to what end? If you can't make 13 wpm for your General or Advanced license, you may as well switch over to CB.

Thomas (NØUFQ) Rampton's article in the May 1995 issue of *Radio Fun* was as if I penned it myself. His illumination of the code and licensing encumbrances imposed on us by the FCC, probably in collusion with the ARRL, and those stuck in yesteryear, supports the sad reality that the young, imaginative, and technically competent are discouraged from seeking our company. We need these folks to re-energize the hobby.

But what really galls me, almost to a point of wondering why I even got my ticket or why I want to remain active and advance, is the behavior I hear on 2 meters. It is their repeater and they can do whatever, but the "zeds," "clear on your finals," and the inane chatter, often in excruciating detail, about one's personal life and, in too many cases, private affairs of others, is appalling. And they worry about CBers joining the club! I believe proper radiotelephone procedure, as I learned it in the military and used worldwide, should at least equal the weight given the sacrosanct Morse code. You can identify and appreciate the radio professional as soon the mike is keyed.

Randy Moeller KI7MU Wayne, I want to tell you how your writings have changed my life. In 1993, I was just another 29-year-old greenhorn litigator two years out of law school. I'd spent my life coddled by a school system that taught me not to think, had prepared for a career that required little innovation, and was working for a firm that offered me no chance of advancement. One day, when Harry Helms' book on ham radio caught my eye in the bookstore, I noted his remarks about Wayne Green's controversial columns in 73 magazine. Hmm. The next day, I was at the newsstand, reading that month's "Never Say Die" column. I was hooked. (Yes, I bought it.) Soon, I had a copy of *Declare War*. I began to think, for the first time in longer than I'd like to admit, about the fun of creating things, the lure of electronics and computers, the thrill of controlling one's own life, the value of learning (not credentials), and the basic principles of capitalism. I share your love of music, too, and you got me thinking that litigation and syncopation don't mix well . . .

Before long, I was enrolled in community college, studying electronics and computer programming. It was a blast (although I've decided to end the classwork and start learning on my own). I even got my Advanced ham license. I've thought about being a patent lawyer—took the bar for it earlier this month—but your way of looking at opportunities is contagious, and I no longer think of law firms as sugar daddies who are there to take care of the poor tenderfoot associates. Instead, I'm thinking, "What companies around Seattle are creating interesting software and electronics for musicians? What can I do to make creation easier for them?" Maybe I'll work at the new Jimi Hendrix Museum (which is supposed to have many interactive exhibits to teach people about music in general) or a MIDI software company across Lake Washington. Or maybe I'll put together some

products of my own. You've spent your life encouraging freedom of expression and the exchange of ideas, and I want to do that, too, as well as I can. Thank you for opening my mind. As long as it's open, here are a few random thoughts:

Please add my name to the list of people who would eagerly buy your book on how the brain works. I hope you can find the time to write it.

I eat your onion slumgullion all the time, with applesauce made from your recipe. Yum.

Have you seen those little comic books put out by the Japan Travel Bureau? The ones that explain various aspects of Japanese culture, tell you how to live the life of an expatriate, identify famous Japanese, and so on? They're fun to read and are laid out very attractively. I believe a series of similar comics might be very effective in promoting New Hampshire as a tourist paradise (the *New Hampshire To Do* series, perhaps?).

Have you ever read Robert Anton Wilson's books? He also writes about the way human minds work. He uses "circuit theory" to describe brains, postulating that there are eight circuits which control our behavior—including the oral bio-survival circuit, the anal-emotional circuit, the tune-binding semantic circuit, and the moral sociosexual circuit. I think his *Prometheus Rising* does a great job of explaining, among other things, why lawyers in court resemble a group of gorillas at the zoo and why "sound bites" tend to prevail over logic. If you like this book you might like Antero Alli's *Angel Tech*, also printed by New Falcon Publications (655 East Thunderbird, Phoenix, AZ 85022). Wilson's *Schrödinger's Cat* is a good science fiction read and illustrates many of his ideas in a frothy, life-affirming, Shavian way.

How about Jack Lessinger's *Penturbia*? It has some interesting historical theories on why suburbia must ebb and "penturbia"—counties with natural beauty, educated workers, and a backlog of easily-renovated buildings—must flourish in the next 15-odd years. Lessinger likes Carroll County in New Hampshire. He's made me think hard about relocating to the San Juans here in Washington.

I've been listening to Max Roach's *To The Max*, Bobby Hutcherson's amazing vibes performance on Eric Dolphy's *Out to Lunch*, and Javanese gamelan music. Tremendous stuff, all. It'd be interesting if somebody used gamelan instruments in a jazz band along with (or instead of) traditional percussion instruments.

Do you like souskous music from Zaire? Celluloid put out a very fine compilation several years back called *African Connection Vol. 1: Zaire Choc!* It's got astounding polyrhythms and lively, freeflowing melodies that make it hard for me to sit still. Franco and Rochereau's *Omona Wapi* (on Shanachie) is great, too.

You're so far ahead of the curve that you probably beat me to reading Lewis Perelman's *School's Out*. It sure is thought-provoking. I'm trying to think of ways to help Perelman's "hyperlearning" system come into being. We'll all advance much more rapidly when the country values actual skills more than credentials, and this will be easier when kids (and adults) can learn in an upbeat, interactive way without boring textbooks or uninspired teachers. I like Perelman's metaphor of the ideal education system as a shopping mall where people can go to learn what they want

to. As you've said, why take calculus if you'll never use it, just because somebody who believes he's higher in the "pecking order" says you have to? (I'd get my EE, but I believe I can learn what I need to more quickly and cheaply in the real world, and besides, I want to demonstrate what can be done without credentials.) I like your vision of a new technical academy too—it adheres well to Ivan Illich's sane ideas. Thanks again, Wayne.

And thank you, Randy! Yes, I enjoy souskous. I enthusiastically reviewed a French CD of African souskous I discovered in London for my CD Review magazine ten years ago. I'll check into the Japanese comic books—and keep on writing.

... Wayne.

Paul Kearns, Ashland OR I've been a licensed ham for only one year. I've enjoyed your editorials and have chosen to subscribe to *Radio Fun*. I don't share your opinions on everything, but I think you like that. I thought you or your readers might benefit from hearing my views. My perspective may be somewhat fresh and not biased by years of exposure to this great hobby we all enjoy so much.

It seems to me that the greatest controversy in amateur radio today is the 13-wpm CW requirement for operation on a significant portion of the world bands. I think that you have mentioned that this requirement is an ITU regulation. Does the ITU require a certain speed of CW or are the FCC requirements above 5 wpm unique to this country?

Maybe 5 or 10 wpm is fast enough for General Class privileges? It seems to me that most people taking the time to learn code at 5 wpm will eventually increase their speed to more reasonable rates should they continue to use it. I find CW to be a challenge that requires some effort to overcome. I put forth that effort because I find CW operation to be enjoyable. I doubt that many of the CW operators you routinely hear on the amateur bands feel differently.

Why do I enjoy CW? Two reasons. First and foremost, CW appears to me to be the surest way to call CQ and get an answer on the HF bands. The SSB operators appear to fall into two groups. One group, the net or sked operators, often appear to be acquaintances who routinely talk to one another. I do not feel comfortable trying to break into these groups, though most of them would probably welcome newcomers in. The second group, contesters, are simply collecting QSLs via voice mode. I seldom hear any contesters calling CQ on HF SSB.

In my opinion, CW offers a medium, thanks to its rigid protocol, in which complete strangers can meet and comfortably exchange information. This exchange is possible without hindrances brought on by language differences, age, net worth, class, accents, race, gender, or God knows what else.

My second reason for enjoying CW is its efficiency. I am not aware of any other mode that will communicate as far on as little power with a conservative rig and antenna system. Maybe, in time, satellite communications will develop to the point where this is no longer the case. I don't see it changing soon, however.

I appreciate that amateur radio needs lots of hams to retain its piece of the radio spectrum pie. Maybe the Gods of Radio Land should take a look at opening the gates wide enough to allow our numbers to grow at a respectable rate. But please, let's not push to open the gates so far as to allow the amateur bands to be jammed with the type of operators that ruin the enjoyment of radio because they have put little effort into getting a license and care less what other people may think of their operating practices. Look what loose licensing has done to CB.

RF

SAD 'CAD Battery Charger

A simple-as-dirt nickel cadmium battery charger.

by Paul Stump NØLRF

This one-evening project will allow you to properly charge most battery packs without the worry of cell-damaging overcharge, or the embarrassing heartbreak of having a weak package when you need it most.

Most packs these days are made of AA-size (penlight) cells. Without boring you with the details, suffice it to say that a battery pack made up of this size cell likes to be charged at around 50 milliamps (mA) for 12 to 14 hours to develop a full charge. The C- and sub-C-size cells like it a bit higher—more on them later. The supply voltage will ramp up during normal charging in order to maintain the current flow. Battery gurus recommend a trickle charge of 10 to 12 mA to maintain the virility of cells this size indefinitely. The simple current-limiting circuit which follows provides safe and easy charging.

Fortunately, I have found a use for one of those ubiquitous plastic 35mm photographic film cans I have been collecting for

years. I needed a device which can be plugged into my bench power supply when needed, and easily removed when not in use. The entire circuit fits in one of these.

The 50-mA charge is easily timed, either overnight or during the daytime hours. Of course, you can add a timer circuit to switch the charge rate to 11 mA after 12 to 14 hours if you like. The only other requirement is a DC power source. I'm using a 12-VDC bench supply to charge packs from 2.4 volts to 7.2 volts. The power supply can be a wall plug unit rated over 50 mA. Whatever you use, it should provide the nominal battery pack voltage times 1.5. Remember, one cell equals 1.2 VDC. To charge a 9.6-VDC pack (8 cells) you'll need a voltage supply of $1.5 \times 9.6 = 14.4$ VDC or higher voltage.

The beauty of this arrangement is that you don't need different battery chargers for different voltage battery packs—one size fits all. The key is *current/time*:

1. 40 to 50 mA for 12 to 14 hours,
2. 10 to 12 mA thereafter, or disconnect.

The trickle charge (10 to 12 mA) is not required, but should be used to ensure that a pack is kept at its maximum potential until you need it.

To charge battery packs that are not AA-size cells, keep these numbers in mind:

1. Normal 12-hour charge = cell capacity (mA/hour) divided by 10,
2. Trickle charge = cell capacity (mA/hour) divided by 50.

Cell capacity for a AA cell is from 250 to 600 mA/hour (as of this writing). I've used 500 mA/hr. (mAh) for my equations. A sub-C- or C-size cell is rated from 1000 to 1500 mAh. Therefore, normal charge would be 100 to 150 mA for 12 hours, and trickle would be 20 to 30 mA for the C sizes. By changing the value of the circuit resistors, you can adjust the charge current values as needed.

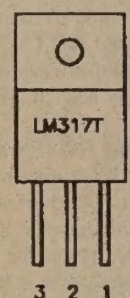
This circuit can also be used as a con-

stant current drain to discharge a battery pack. Simply connect the +12 VDC IN (banana plug) to the battery pack positive lead, and the output (banana jack) to the battery pack negative lead. It might be helpful to include a light emitting diode (LED) and resistor to announce the discharge. This cycling (charging and discharging) is recommended, but my batteries generally just die of natural causes before I can properly massage them. Therefore, *experiment!*

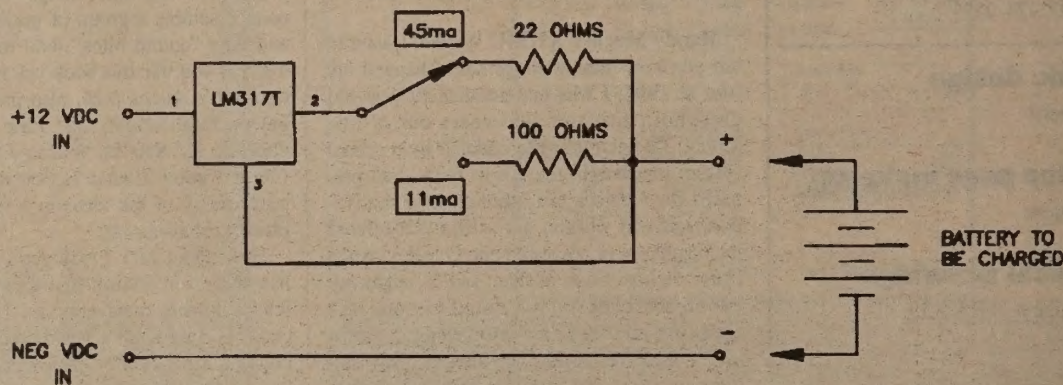
This project is simple and versatile. Some of the battery packs I have charged with this circuit include: 2.4-VDC screwdriver, 4.8-VDC handheld radio, 6.0-VDC flashlight, 7.2-VDC drill, 7.2-VDC GPS receiver, 4.8-VDC and 9.6-VDC (increased supply voltage to 15 VDC) radio control system batteries.

Next, I think I'll add a digital timer, automatic periodic discharge and recharge, maybe even a...

RF



(FRONT VIEW)



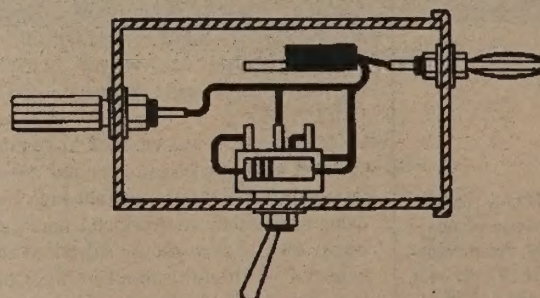
SCHEMATIC DIAGRAM

BILL OF MATERIALS:

1. 1ea LM317T VOLT. REG.
2. 1ea 22 OHM, 1/4w RESISTOR.
3. 1ea 100 OHM, 1/4w RESISTOR.
4. 1ea S.P.D.T. TOGGLE SWITCH.

NOTES:

1. S.A.D. = Simple As Dirt.
2. CURRENT SETTING OF 45mA USED FOR NORMAL CHARGE OF 12 TO 14 HOURS.
3. SWITCH CURRENT TO 11mA AFTER 14 HOURS OR DISCONNECT FROM CIRCUIT.
4. SPECIAL THANKS TO DENNIS COSHOW (the BATT'MAN) FOR SHARING HIS TECHNICAL KNOWLEDGE.



COMPONENT LAYOUT

Figure 1. Schematic and layout of the SAD 'CAD.

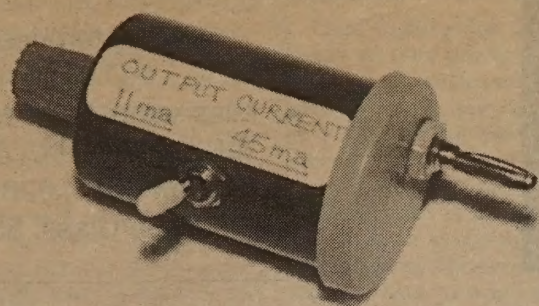


Photo A. The entire circuit fits in a 35mm film canister.

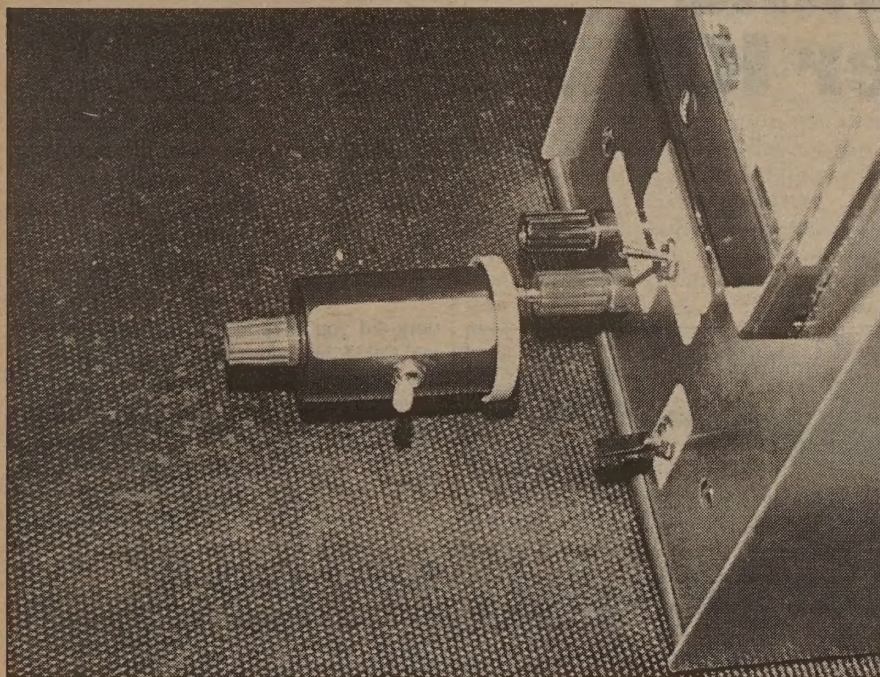


Photo B. The SAD 'CAD plugged into a power supply.

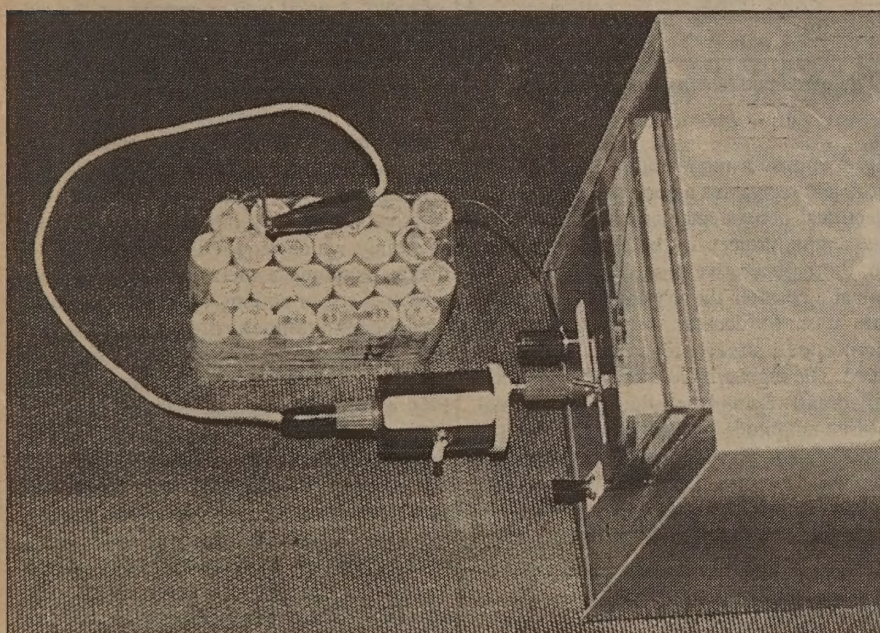


Photo C. The NiCd cells plug into the SAD 'CAD for charging.

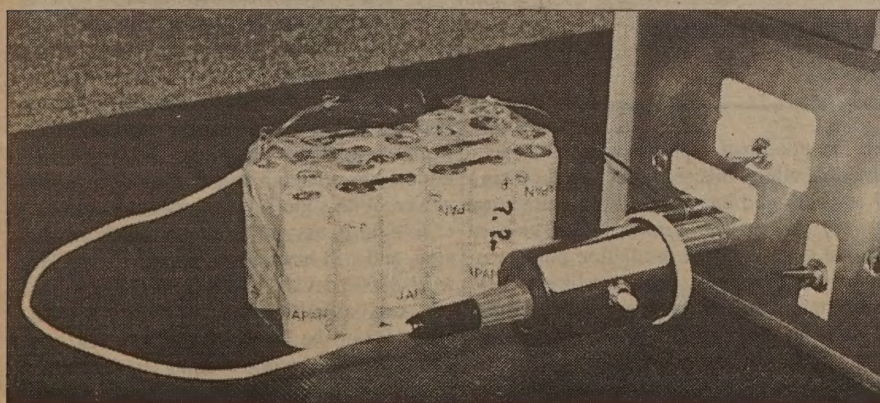


Photo D. A closer view of the SAD 'CAD doing its job.

Oklahoma Bombing

Continued from page 1

and transferred and their use coordinated. Our big contribution, I think, was the fact we operated out of areas where there were no normal communications. Virtually every one of the Salvation Army's six canteens were set up in the middle of the street, obviously with no phone service. Most of the buildings around the area were condemned and not inhabitable. We were the only non-public service communications available."

There were technical challenges to overcome in providing communications. Webb says Oklahoma hams have a name for the very area in which they had to set up stations. "We were in what is referred to as Intermod Alley. The canteens, being located on the street, in the first few days moved quite frequently. In one place a hand-held transceiver would work quite nicely, but if we moved a hundred feet in one direction it wouldn't work at all. So we discovered that some sort of portable gain antenna is necessary in a situation like this. We also had problems the Sunday after the explosion when all of the pager, commercial, and public service radios started coming back on the air down there and the intermod interference really started to get bad for us. We had to fabricate some intermod fitting stubs and send them downtown so folks could use those to help with the intermod problem," said Webb.

Disaster-ready hams in Oklahoma know how important being prepared for emergencies is. They keep emergency communications kits in their cars. The kits include materials like batteries, power adapters, and magnetic mount antennas. That kind of thinking ahead gave hams an advantage during the crisis. Webb says amateur radio operators put in a total of about 5,500 hours assisting in the explosion's aftermath. Now they can look back at the nearly two weeks of communications services that they provided.

"I wouldn't want to do it again," Webb remarked, "but it certainly makes me feel good about the way we handled it, about the way all the agencies that were involved handled it. As one ham in the local area put it, 'I have never been prouder of my ham ticket than over the past two weeks.'"

April 19th brought the kind of communications emergency most hams have never even dreamed about. But Tom Webb says the Oklahoma hams handled it. And they did it with professionalism and pride.

One ham was inside the federal building when the explosion hit, but escaped without injury. A second ham was inside a department store across the street from the Federal building; the blast threw him across his desk. But he escaped serious injury by grabbing his chair as he was being blown across the room. That helped protect him from flying glass. Tom Webb says that as far as he has been able to determine, none of the people killed in the explosion were amateur radio operators. *TNX Amateur Radio Newsline.*

Illa Tiki Makes Waves

The sailing raft duplicating the *Kon Tiki* set sail from Ecuador on March 30, heading for Hawaii. They will be keeping a regular schedule with AA5MT on Tuesdays and Thursdays at 1900 UTC, meeting on 14300, the Maritime Mobile Net, and then moving to a clear frequency. Schools will have priority for contacts. When schools are finished, family messages will be sent and then other hams may join in for a QSO. John KC5KHA/MM is the chief op on the raft.

The *Illa Tiki* is a balsa wood log raft and was built similarly to the *Kon Tiki*, which Thor Heyerdahl sailed from Peru in 1947.

His objective was to prove that people could have migrated from South America and inhabited the islands. The *Illa Tiki* is making about 1.5 to 2 knots and the crew comprises five men—three from Dallas, one from Ecuador and one from Austria. *TNX The Paper Repeater and PARKing Ticket*

Rewards Paid for Vintage Thruline Wattmeters

Bird Electronic Corporation has launched "Quest 43" to locate the oldest working Model 43 Thruline wattmeter. Quest 43 will help celebrate Bird's recent production of the 250,000th Model 43. Rewards for vintage Bird test instruments include a 24-kt gold-plated Model 43, new wattmeters, and \$250 to \$1,000 gift certificates. Winners will be announced at the IWCE 1996 Convention.

The production of the first Model 43 Thruline wattmeter in the early 1950s heralded a major breakthrough in RF power measurement. Four decades later, the Model 43 still provides unsurpassed +/- 5% full-scale accuracy and legendary dependability. Bird wattmeters have survived being dropped from towers, immersed in floods, and even being run over by a bulldozer. Bird

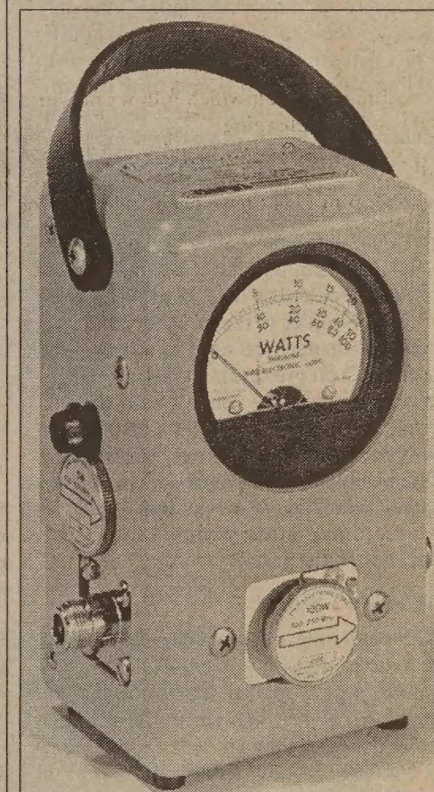


Photo B. Find an old Bird, and you might win a new gold-plated one!

anticipates finding many working units with low serial numbers.

Rewards will be offered to owners of the ten lowest serial number Model 43 wattmeters in working condition. The owner with the lowest serial number will receive a 24-kt gold-plated Model 43 and a \$1,000 gift certificate that can be used to purchase items in Bird's gift certificates. All ten owners will be sent a brand new Model 43 to replace their vintage unit. A consolation prize drawing will be held among all other participants.

Entries must be received by January 31, 1996. Winners will be formally announced at next year's International Wireless Communications Expo/Spring '96 convention in the Las Vegas Convention Center, April 24-26, 1996. All Model 43 owners are encouraged to contact Bird Electronic, Attn: Greg Johns, (216) 248-1200 Ext. 261, for an entry form to participate in QUEST 43. *TNX Bird Electronic*

MFJ Enterprises, Inc.
P.O. Box 494
Mississippi State MS 39762
Telephone: (800) 647-1800;
Fax: (601) 323-6551
Price Class: \$59.95

MFJ-8100K World Band Shortwave Receiver Kit

by Larry R. Antonuk WB9RRT

The rift between the hard-core homebrew experimenter and the dedicated appliance operator is deep and wide, and showing no signs of narrowing. (Indeed, the only reason for the end of the conflict might be the fact that one side of the dispute seems to be dying off.) This situation is truly unfortunate, for the fact of the matter is that to really understand a hobby or vocation, you need to spend a little time becoming intimate with it at a very basic level. If you want to be an outstanding photographer you have to spend time with your hands in the developer. Fly fishermen only go a year or two before they decide that they need to tie their own flies. In order to really understand how to run a computer, you need to at least type in a BASIC program. This type of connection with your hobby needn't be a lifetime pursuit; it simply lets one get a taste of the history and tradition of things. In no hobby is this phenomenon more important than in amateur radio, but it seems that lately we have more and more trouble holding our connection to the past.

Where Do I Start?

The beginning level of understanding in ham radio is obvious—electronics. You simply need to pick up a soldering iron and put something together. Many hams have a great interest in home-brew projects and kit building, but have trouble finding projects that are both within their range of competence and are at least moderately useful. There's nothing in the world quite like building a project, plugging it in, and having it *actually work!* On the other hand, if you've already built the A) code practice oscillator, B) ten-minute ID timer, and C) field-strength meter, you may have exhausted the list of potentially successful projects. This is where it makes sense to switch to building a kit. When building a kit you're assured that the design is correct, that all the parts are available, and that the thing has a good chance of working when you fire it up. Assembling a kit provides a good way to learn a little electronics, save a few bucks on an item, and get acquainted with ham radio on a nuts-and-bolts level.

Choices for a first kit abound, but a good starter kit might be the MFJ-8100 World Band Receiver. The MFJ-8100 is a five-band receiver that tunes subbands between 3.5 and 22 MHz. It uses standard "Walkman" style headphones, with two jacks so you can listen with a friend. The radio tunes with a 6:1 vernier dial, and has a manual re-

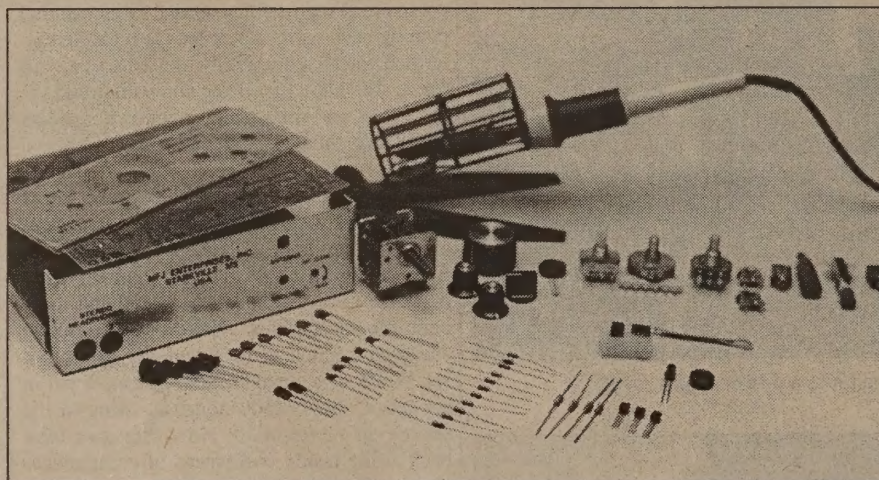


Photo A. It's always a good idea to lay out all the parts and take a quick inventory.

generation control. It can tune in AM, CW, or SSB signals, runs on a nine-volt battery, and you can put the whole thing together yourself.

Why choose a shortwave receiver as a first project? First off, it really works. Rather than some obscure station accessory, why not build something that's fun and actually usable? Second, it's easy to build. Not only will the builder have a reasonable chance of putting this together before he or she loses interest, it will actually work when it's completed. You can't argue with success. And third, it's cool. For the beginner there's the ultimate cool—building some-

thing that can hear stations from across the world. For the seasoned ham it's cool because you can hear those same stations, knowing full well you're doing it with just a handful of parts. As a matter of fact, the only problem with building this with an Elmer is that there might be some argument over who gets to take it home!

"Why choose a shortwave receiver as a first project? First off, it really works. Rather than some obscure station accessory, why not build something that's fun and actually usable?"

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Why a Regen?

So if you're going to build a receiver,

why a choose a regenerative type? Mainly because it represents a good compromise between real performance and a fairly simple-to-assemble project. In the early days of radio, the regenerative receiver was the next logical step after the crystal set, and many were in use for decades, even after the more complicated superheterodyne was introduced. The regenerative receiver simply amplified and re-amplified the desired signal, until its amplitude was such that it could be demodulated. The amount of re-amplification was set with the REGENERATION control, which is normally set at the point just before the circuit goes into wild oscillation. The good part of this was that the operator could adjust this set-point based on signal strength and band conditions, allowing for very precise fine-tuning. The bad part was that once the wild oscillation point was reached the receiver acted more like a QRP transmitter, radiating these oscillations right out the not-too-selective front end, up the cable, out the antenna, and right into everyone else's receivers all across town. One can imagine the bedlam during a pileup—not

only did you have to contend with the normal QRM, but with all the local garbage being transmitted—right on the rare DX frequency. Most regenerative receivers were one-or-two tube affairs, with some using half the tube for a QRP transmitter. Over time, as technology advanced, the regenerative receiver gave way to the superheterodyne, which used one or more fixed intermediate frequency sections and a variable frequency local oscillator/mixer arrangement. The interesting part of all of this is that the MFJ-8100 uses 1990s technology to implement a 1920s design. This makes the MFJ regen a much better receiver than practically anything available in the early days of radio. A good way to understand the difference is to look at the radios in terms of the number of "active elements" used. Most of the tube-type regen sets would use one or two tubes. A dual-section tube could be used, with one section used as the regeneration oscillator and one section for audio amplification to drive the earphones. This type of project meant several batteries, or a power supply which required rectifier tubes. It meant punching a metal cabinet to mount tube sockets, or coming up with an unstable breadboard arrangement. By contrast, the MFJ-8100 uses two field-effect transistors to act as the oscillator/detector stage. A third FET is used as a separate RF amp stage, to boost weak signals and to prevent oscillations from traveling back out the antenna. The audio is amplified by an LM386 integrated circuit, containing dozens of transistors. All of these devices run easily off a nine-volt battery. The added RF amp stage is especially important. It's fairly easy to add an extra RF amplifier stage when all you need to do is add a transistor and a few passive components. In a tube receiver, you may have wanted that stage, but the amount of extra work required to get yet another tube on the chassis would have made it more trouble than it was worth. In other words, if you're going to have three tubes, why not go one or two more and build a superhet? Due to the available technology, the regen was doomed to remain a low-end, entry level receiver. With solid state components, however, it's fairly easy to "soup up" the basic design, and still have an easy-to-build kit. The MFJ-8100 provides more front-end selectivity, audio amplification, and tuning stability than all but the fanciest tube sets, and you can bang it out in one evening. In the time it took your grandfather to punch the chassis holes and wire up the power supply, you can

have this entire radio built and be listening to Radio Moscow. In case you're wondering, you can actually listen to a lengthy shortwave program on this radio without a whole lot of operator intervention. The classic picture of the regen operator with headphones clamped to his head, one hand on the TUNING, one jockeying the REGEN control, squeals and howls in the background—well, it *can* be like that, if you're working some rare DX. For the most part, however, you simply tune the station in and leave it at that. Follow-up adjustments are rarely necessary, allowing one to listen with relative ease. This is somewhat dependent on the signal strength—the stronger the station, the less adjusting that needs to be done. As shipped, the MFJ uses only headphones. However, an amplified speaker (again, the type you use with your Walkman) works great for casual listening. If you don't have one of those amplified speakers kicking around modifications are included that allow you to drive a speaker with the addition of another LM386 chip.

Getting it Together

Construction of this radio is very straightforward, making it ideal for an Elmer-guided project, or for the first-time builder who wants to go it alone. The documentation is very clear and concise, and gives lots of tips at various stages of assembly. Steps are laid out in a "check box" manner, allowing the builder to put together

On the Air

Once construction is complete, you're ready to start tuning in some rare DX. Hook up an antenna to the input jack—depending on the time of day, a few feet of wire might be sufficient—and start tuning around. The manual gives detailed instructions on the use of the REGEN control, but the basic idea is to keep the control advanced as far as possible without going into oscillation. The stronger the station, the less you have to worry about accurate regeneration, and the easier it is to tune it in. It's difficult to describe the sound and feel of this receiver, but as soon as you hear it you'll be reminded of the tense "radio shack" scenes in those low-budget World War II movies. Endless heterodynes and birdies fill the dial, but once you get the hang of the tuning operation you'll be keeping the tweets and whistles to a minimum while you tweak the dial for just the right tone on that shortwave station.

The MFJ-8100 is definitely a shortwave receiver, not a ham receiver. In other words, each band covers a great deal more than just the ham bands. For instance, band D covers 13.2 MHz to 16.4 MHz, spread over just a few inches on the dial. Of this, the 20 m band takes up about one quarter-inch. On the other hand, the 80 meter band takes up the better portion of the dial. While it certainly would be possible to use the MFJ as the receiver in a QRP station, the frequency spacing on the dial

"The interesting part of all of this is that the MFJ-8100 uses 1990s technology to implement a 1920s design."

er as much as time allows without losing one's place. Construction is separated into six phases, based on circuit function and physical board location. If the MFJ-8100 is being built with a newcomer, these six phases would make a good way to break up the project over a week's time, finishing one or two phases a night. An experienced kit builder can easily assemble this radio in an evening, but if one wants to make it a learning experience—discussing the function of each part, checking the resistance values with the ohmmeter before installation, checking and double-checking—it may take a bit longer.

The high-quality circuit board has a very low component density, making it easy to place parts and to make the necessary solder connections. Due to the masked resist on the solder side, all connections come out looking very professionally done. All of the pots and switches mount directly on the main board, meaning that there are no wires to run to cabinet-mounted switches. This makes for a more reliable radio and greatly speeds assembly. Once the main board is finished, you simply slide the board into the custom housing and mount the knobs on the front. One wire needs to be soldered from the main board to the antenna input jack, and you're in business. At this point the radio can begin tuning in loads of ham, shortwave, and commercial stations. If you want to get things just perfect, the manual gives instructions for frequency alignment of the main tuning control. This is accomplished with either a station of known frequency, such as WWV, or by using a communications or ham receiver of known accuracy. Obviously, the accuracy of this type of dial is not quite the same as a digital readout, but it helps to get it as close as possible!

may make it a little difficult to dig out the weak ones. However, the size of the unit just begs for a QRP transmitter and keyer to be built right into the cabinet—there's plenty of room. A good many hams made their first contact using a shortwave receiver (previously used for lots of SWL QSLing) in conjunction with a crystal-controlled transmitter, so this certainly is within the realm of possibility. In addition, due to the simplicity of the circuit, it appears that a bandspread control could be easily added.

A Real Cabinet

One feature of the MFJ that really deserves attention is the mechanical construction of the device. The metal cabinet and the silk-screened front panel give this radio the appearance of being, well, a *real radio*. While it's obviously not a full-fledged communications receiver, it doesn't quite look like a kit, either. In marked contrast to the "ugly" construction practices of a few years back, you will be quite proud to be the owner/builder of the rig. It might even deserve some valuable shelf space at the office. "Yes, step into the office, Henderson. Just let me turn this thing down . . . What's that? . . . Oh, just Radio Uzbekistan—listen to them every afternoon. Yes, yes, it is . . . nice little rig . . . built it myself, by the way."

For the uninitiated, the "ugly" construction mode was implemented as a way to get more people interested in construction projects by making it easier to produce a working radio. The concept was based on the premise that most people were intimidated by excellence rather than inspired by it, and that by lowering the standards more people would get involved in home-brew projects. QRP rigs were being built in tuna

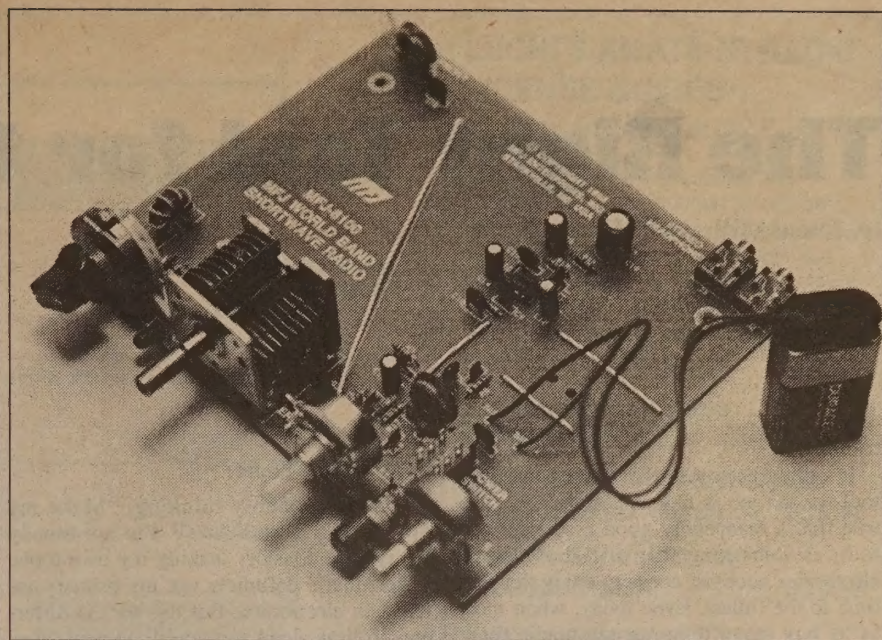


Photo B. The circuit board has plenty of real estate available for future modifications.

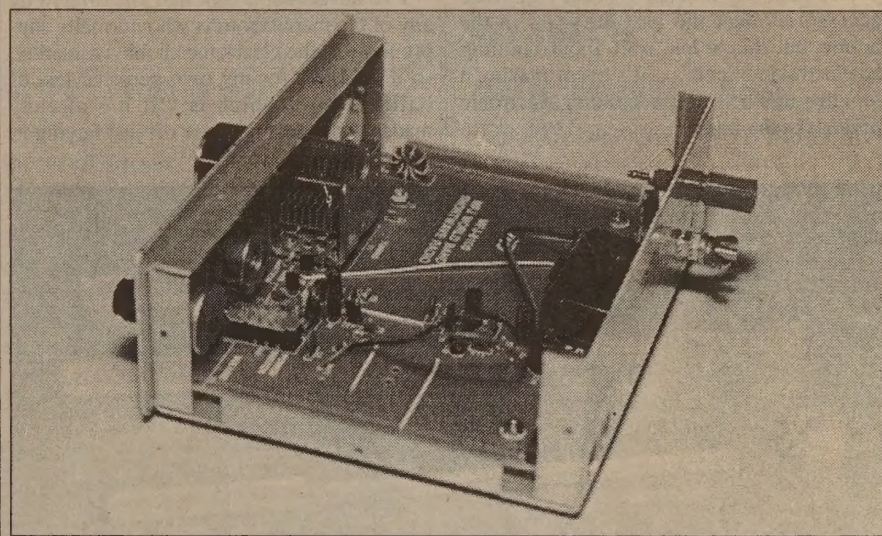


Photo C. The finished circuit board slides easily into the aluminum housing.



Photo D. The assembled unit appears very presentable.

fish and cat food cans, held together with blobs of solder and adhesive tape. Whether or not this scheme actually got more timid souls to fire up their soldering irons is debatable, but it most certainly did a great deal to lower the already suffering image of the weekend home-brew enthusiast. Imagine the sight of our typical ham—Coke-bottle glasses taped together at the bridge, pocket protector jammed with pencils, call-sign baseball cap, fifty pounds overweight—lumbering into the office proudly showing off his new creation, a re-

ceiver that oddly resembles a cat food tin full of floor sweepings. Not a problem with the MFJ, of course. This receiver might even have the people in the office stopping by for their afternoon dose of the BBC, and wondering how they could get their hands on one of those neat little radios for themselves.

The MFJ-8100 represents a good starting point for the beginning kit builder. Useful, fun, and not too tricky to build, it also proves that kit building is alive and well on the American ham scene. **RF**

The Right Tool for the Job

by Dave Miller NZ9E

It's often been said that having the right tool for the job is half the battle! It's also true that a reasonably good assortment of tools is something that just about every electronics hobbyist needs to enjoy the pastime to the fullest. Even today, when most of us buy many things ready-made, there are still those times when we find ourselves building those little extras that no one seems to offer anywhere else.

I've built any number of these electronic accessories over the past 40 years in the hobby, but this article isn't about building an electronic circuit . . . it's about making a tool that will help you in building electronic projects in the future.

Why Make Tools?

You're probably thinking, "Make my own tools . . . no thanks!" I'm not usually the type to consider making my own tools, either; that's definitely not my primary interest in electronics. But this tool is different—follow along and you'll see why. Plus, it's not all that difficult to fabricate—otherwise I certainly wouldn't have been able to do it!

I've never seen a tool like this offered by any of the manufacturers who normally supply tools to the electronics hobbyist market, so it qualifies for my own personal test of build-or-buy, which is: "If it's already made, I'm probably better off just buying it,

but if it's not, then perhaps I should consider making one myself!"

Like most electronics enthusiasts, I find myself using a great many of the 1/8" (3.2 mm) miniature and 3/32" (2.4 mm) subminiature phone jacks on different projects. These are the common panel-mount type of small phone jacks sold by Radio Shack and others for bringing audio—and any number of other signals—into and out of a piece of equipment.

They're great! They are inexpensive, do the job, are easy to wire, etc. The problem I've always run into, however, is how to tighten down the tiny slotted nuts that are used on these jacks so that they aren't ruined, physically or appearance-wise. Sound familiar? Most of us simply end up using a pair of ordinary pliers, or perhaps a very small straight-blade screwdriver, in an awkward attempt to tighten down those tiny slotted mounting nuts on these little jacks. I almost always ended up marring the slotted nut itself, or the panel behind it, or both! I've done a pretty good number on some of these over the years . . . but not anymore!

Designing the Perfect Tool

When faced with a problem such as this, I've always found it best to sit back and try to imagine . . . if I had the perfect tool to use on this, what would it be?

That sort of approach usually works for me, and in thinking about this one, I finally came up with what I call the *Slotted-Nut Tightening Tool*. It's shown in Figures 1 and 2, and in Photos A, B, and C. As far as I've been able to tell, no one makes a tool of this type commercially, but it's something that all of us who work with miniature and subminiature phone jacks need! It's amazing sometimes how an obvious need escapes market fulfillment, but yet, there it is.

The slotted nuts used on these jacks require a tool of the correct diameter, with the correct size of mating pins or projections built into it. It has to be of a material that's harder than the material you wish to use it with, and it should be reasonably easy to grip. With these basic parameters in mind, I began to develop the tools shown.

Oh, that's right, you'll actually need two tools—you knew there was a catch somewhere—one for 1/8" jacks, another for the 3/32" variety. But the 1/8" one is probably most often used, so it would be the best one to start with (the 1/8" tool can also be used on some miniature toggle switches, those that use the same type of slotted nut for their mounting). It's for this reason that this article will concentrate on the 1/8" tool specifically, but most of what is said will apply to the smaller diameter 3/32" tool as well.

The slotted nuts used on most miniature panel jacks appear to be made of a nickel-plated brass. The first prototype tool that I made for myself was also brass, but I

wouldn't recommend using a material that soft for the finished tool, because it's too easily damaged—that one was strictly a prototype. Once I had proven to myself that the tool dimensions were correct, a friend who's an accomplished machinist made several more for me out of steel. These have proven to be quite serviceable. Tool-hardened-steel isn't really necessary, just garden variety steel is fine, since those slotted nuts you'll be using it on aren't made of a hardened material.

Following the dimensions shown in Figure 1, the steel rod should be about 5" long for an easy grip and good control. It's made of 5/16" (0.3125") diameter steel rod with a 5/8" long 7/32" (0.221") hole drilled directly in the center—this can be the tricky part. If you can locate a section of hollow steel tubing of these dimensions instead, such as steel fuel line tubing, it will make the job much easier for the average home constructor. Solid rod perhaps has a little bit better "feel" to it, since it's heavier, but tubing will work as well dimension-wise and from the standpoint of basic end results.

Filing or grinding down one end of the tubing so that two "male projections" remain is the only other critical part. Take your time. Follow the dimensions in Figure 1, with the tool clamped tightly in a bench vise, and you should have little trouble matching up the projections on the new tool with the slots on an 1/8" panel jack nut.

That, of course, is the final determining factor, making the tool mate as closely as possible with a representative sample slotted nut.

The remainder of the tool's "handle" can be covered with rubber tape, heat-shrink tubing, appropriately-sized cable jacket, or whatever you might have to add some "grip" and "cushion" to it. If you have, or know someone with, a lathe, a knurled handle gives it that final professional touch.

The slotted nut is started onto the jack with your fingers, as you've no doubt always done, and only the final tightening for installation or initial loosening for removal is accomplished with your new tool. It works like a charm, and like so many things, you'll wonder how you ever did without it in the past!

By the way, a friend and I tried a couple of other things. He made up one tool with the proper dimensions on one end for the 1/8" slotted nuts, and then turned it down for the 3/32" nuts on the opposite end. It looks great and works fine, but I've found it somewhat uncomfortable to use, because it always has projections (one end or the other) biting into the palm of my hand from the end that's being used as the handle—one of those ideas that sounds better than it actually works!

Another variation, in the interest of simplicity, was to take a fairly wide, flat-blade screwdriver and simply notch out the material from the center of the blade, leaving two

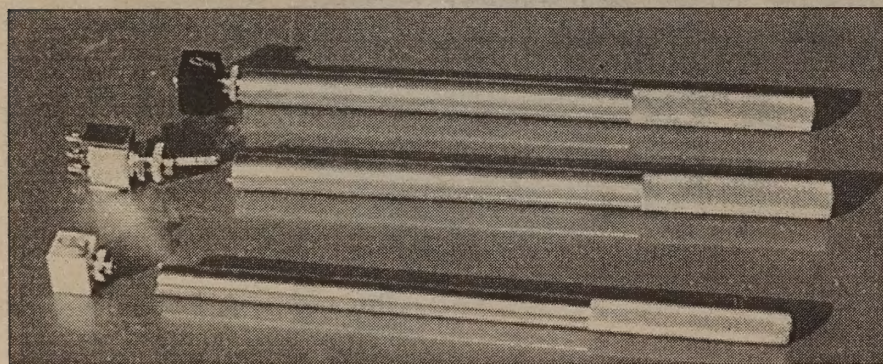


Photo A. The Slotted-Nut Tool described in the article is shown positioned in front of a 3/32" subminiature phone jack nearest to the bottom, in front of a miniature toggle switch that uses the same type of slotted nut (in the middle of the photo) and engaged with a 1/8" miniature phone jack (on top of the photo).

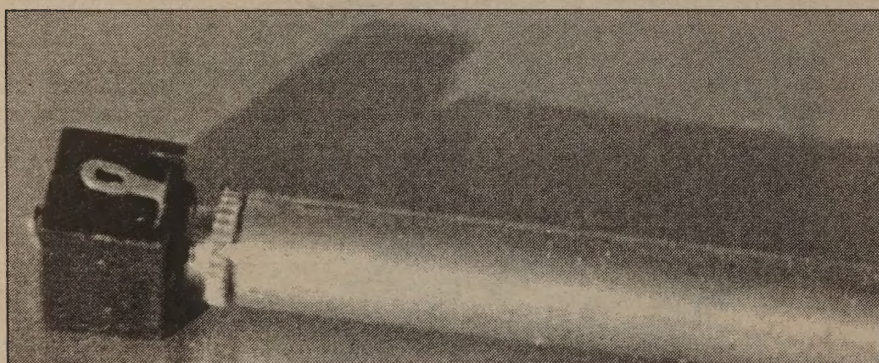


Photo B. The Slotted-Nut Tool shown engaged with the slotted nut on a miniature 1/8" phone jack.

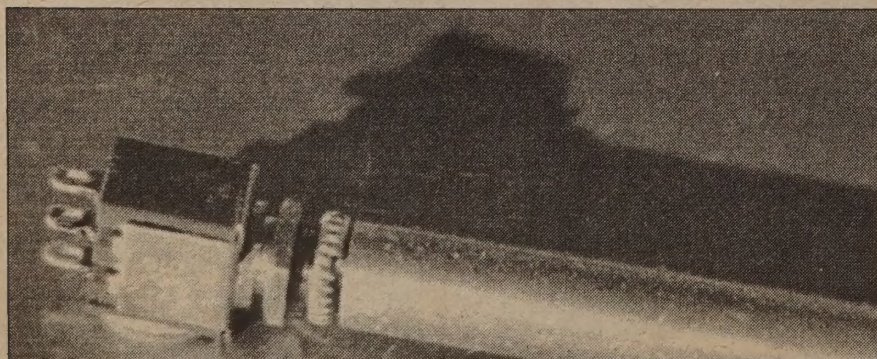


Photo C. Closeup of the tool engaged in the slotted nut used on some brands of miniature toggle switches.

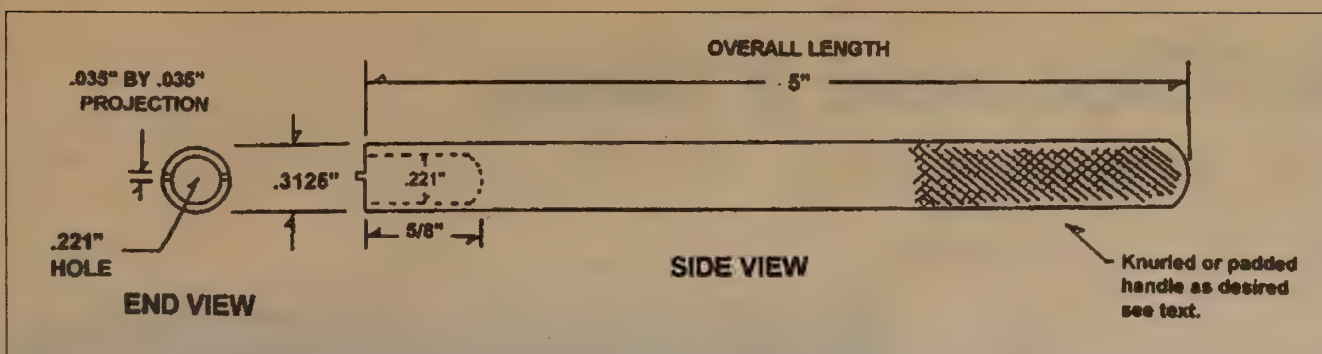


Figure 1. End and side mechanical views of the Slotted-Nut Tool used for 1/8" miniature panel phone jacks.

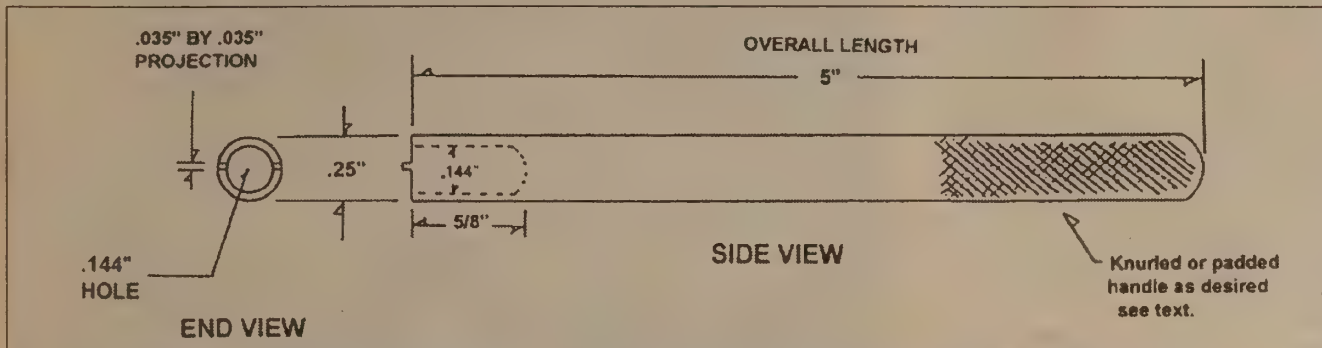


Figure 2. End and side mechanical views of the Slotted-Nut Tool used for 3/32" subminiature panel phone jacks.

projections that fit over the slots of the slotted nut. Again, it works, but doesn't seem to work as well as the tool described in the main body of this article—it can slip off too easily.

In my own experience, I've found that using the suggested configuration shown in Figures 1 and 2 works best, with one

tool for each individual size of phone jack, i.e., one for 1/8" and another for 3/32" jacks.

This is the sort of item that you'll probably only ever need one of (for each size), and it should last nearly forever if it's made as shown. You'll thank yourself over and over again in the future for spending

the small amount of time needed to make one of each now.

The author reserves all of the copyrights on multiple quantities of the tools shown in this article and for their commercial manufacture and marketing, but authorizes individual duplication by fellow electronics enthusiasts for their own personal use. **RF**

What You Missed in 73 Amateur Radio Today

If you don't read the July issue of *73 Amateur Radio Today*, here is some of what you're missing:

- Want nifty pictures of your own weather from the sky? You need a "Dish Antenna for Weather Satellite Images." Don't dish out big bucks! Jim Kocsis WA9PYH tells you how to build your own 5-foot parabolic dish for 1691 MHz.
- And Jim wouldn't just leave you with the problem of weak weather satellite signals. He guides you through putting together "A Low Noise Amplifier for 1691 MHz."
- Who needs radio more than sailors? Do it right: read "Sailing with Ham and Marine Radio Equipment" by Gordon West WB6NOA. "Gordo" will tell you how you can carry these systems aboard without permanent installation.
- If you do a lot of FM voice and packet, you'll want to know what Marty Gammel KAØNAN says about an omnidirectional antenna you can build with 6 dB of gain for under \$10. The "2 Meter Collinear Vertical Antenna" will show you how.
- What the heck is a Bel, anyway, and why do we use a tenth of it for a unit? All you need to know about this sometimes confusing topic is in "A Decibel Primer" from Steven R. Sampson N5OWK. Now you can nod knowingly when those old hams talk about "6-dB gain."
- A high-speed, home-brew "DTMF Decoder" is just what Richard Taylor K7CAH needs to input and keep track of over 600 user and control codes to deal with his local repeaters. Richard gives you the schematic to build it and the BASIC program to run it on your 286 or better.
- Snagging pictures from the air is a breeze with a computer—if you have a "Pasokon TV Slow-Scan TV Interface." Michael J. Geier reviews the hardware/software product that promises SSTV for everyone!
- Need a small yagi for a foxhunt or emergency station? Peter H. Putman checks out a pair of lightweight VHF/UHF yagis in "Maldol Antenna's HS-FOX2 and HS-FOX75." They're backpacker delights at a pound or under, and good directional gain.
- You've also missed our regular monthly columns on radio direction finding, radioteletype, VHF/UHF/microwave, low power (QRP), questions and answers, hints, and more.

You should read the July issue, and every issue of *73 Amateur Radio Today*! Order now and save \$27 off the cover price. You'll receive a one-year subscription (12 issues in all) to the best ham magazine money can buy, for just \$19.97. For instant service call toll-free (800) 289-0388. Do it now! **RF**

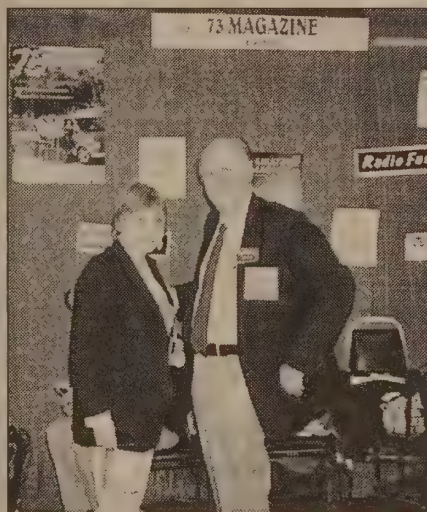


Photo A. Wayne and Sherry at Dayton, 1995. OK, who else has been exhibiting since 1955? TNX Bill Brown WB8ELK.

Correction

Pages 13 and 29 of the June 1995 issue of *Radio Fun* were transposed. We apologize for the error and any inconvenience this may have caused you.

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How My Kid Became a Ham

by H. Wayne Woo KN6MG

Have you ever asked yourself how kids as young as six or seven get amateur radio licenses? I remember going to an event at the local Icom facility and meeting a little girl of eight who held a General Class ticket. Having worked fairly hard myself to earn the same General Class license, I was suitably impressed. At the same time, I wondered how a child could learn the necessary technical concepts or even the math to pass the test. At that time I had not envisioned that the day would soon come when I would come face-to-face with the same dilemma. My own nine-year-old daughter, Kelly, who had been sitting beside me for years watching me operate, decided that she wanted to do more than participate as third-party traffic. Having read all three of Cynthia Wall's ham radio adventure novels (*Night Signals*, *Firewatch*, and *Hostage in the Woods*) no doubt helped.

"Daddy," she said, "I want to get my license." Music to my ears, but what to do? My daughter was in fourth grade in a public school. A pretty good school, as schools go these days, but certainly no great shakes in terms of math and science. Her school mostly concentrated on literary skills. So how do you get a kid who has little knowledge of science beyond names of plants and animals to understand concepts of physics such as electricity and magnetism, let alone waves and propagation? Luckily, there is help available.

Novice or Technician?

The first choice to be made is to decide which entry level license to pursue. Novice is simpler in terms of theory and practice, but requires a 5 wpm Morse code capability. Technician requires no Morse code, but does require more advanced knowledge of theory and practice. Novice offers high frequency operating privileges, but mostly in code, as voice privileges are only allowed on 10 meters. Beyond that, Novice offers phone privileges only in VHF (220 MHz) and UHF (1290 MHz). Technician, on the other hand, offers all modes and privileges for 6 meters and above. And, with the addition of a 5 wpm Morse code test, it also offers all Novice privileges. Kelly would make the choice. We did a little code practice and looked at the Novice theory. After a few days, Kelly decided she would go the codeless Technician route and then later add the code. Once that decision was made, we looked into study aids.

Books, Tapes, and Videos

There are a variety of books, audio tapes, and videos that purport to teach the

prospective ham all he or she needs to know to pass the amateur radio examinations. Several books merely list all the exam questions. Some give the questions followed by the answers and a short explanation of why a particular answer is correct. The audio tapes tend to give a more lengthy explanation of the answers to questions.

Kelly and I went to the local ham radio store to look at the books and tapes. None seemed to appeal to her, probably because they were all mostly straight text with little in the way of graphics or appealing colors (the younger generation puts great store in appealing packaging).

I remembered that I had seen an ad in *QST* for a set of videotapes that the ARRL was offering. I showed the ad to Kelly, and she seemed to think that videotapes might be a good idea, so we decided to take the plunge. An optional offering was a computer program providing organized review as

well as practice examinations. Figuring this would be an all-out effort, we ordered that, too. Another motivating factor was that, in the fine print, the ad stated that should you be unable to pass the examination within one year from date of purchase, you would be refunded your money.

Too good to be true? Maybe, but this was the ARRL, a reputable organization I have known since I was Kelly's age. A simple phone call and the deed was done. Kelly could hardly wait for the package to arrive. Every day, she dutifully checked the mail. Although the order clerk told me it would take five working days to get to California, the package arrived in only three.

Practice, Practice, Practice

Upon opening the package and examining the contents—three videotapes, an instruction manual, two 3-1/2" disks, and a program installation manual—Kelly immediately put the first videotape into the VCR. After a minute or two of introduction and encouragement, the tape plunged immediately into electronic theory, amateur radio practice, and FCC regulations. Breathtakingly fast-paced, we could only watch the tape for a few minutes at a time. Even then, I found I had to spend a lot of time explaining the more difficult topics. Eventually, Kelly stopped watching the videotapes, preferring to be asked the questions directly.

The second thing we did was to install the computer program on our computer. Just for fun, I asked Kelly to take the Novice practice exam the first day. With no formal study or practice, she scored about eight correct out of the 30 questions. This was surprisingly good, considering she could only answer based on common sense.

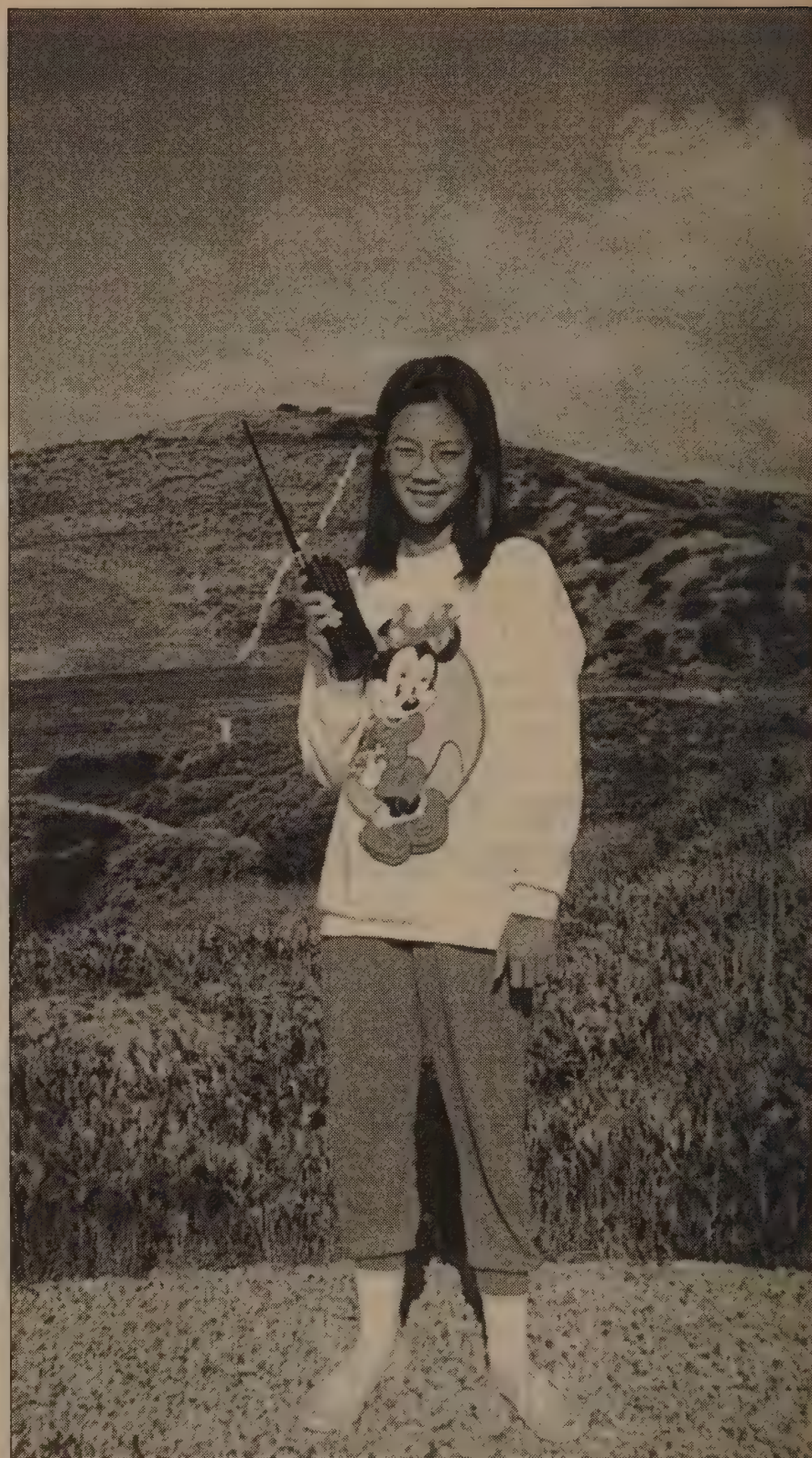


Photo A. *Radio Fun*'s July "cover girl" Kelly Woo looks pleased and proud . . . as well she should, having worked so hard to earn her "ticket." Congratulations, KE6KJU! (And thanks, Dad, for the helping hand!)

Kelly found that she enjoyed the computer exams, so we made it a daily habit to run at least two practice exams and some additional time on review. I would let her take each exam alone and then go through the scoring with her. The program allows you to retake each question missed, so I would try to offer logical explanations of why one answer was better than another, and some hints as

to how to remember the right answers for questions such as frequency privileges and modes.

In addition to the tapes and the computer program, I started reviewing the questions with Kelly. I would try to review material from the tape and then ask questions from the book until she could give the answer even without being given the choices. I be-

came a bit of a taskmaster, using every opportunity to drill and practice. On car trips and walks, I would try to find ways to make the information relevant to what we were doing.

Hard and Easy

Kelly found that some of the questions were easy. Questions of definition, such as what is the control point of an amateur radio station, or of common sense, such as what kinds of messages are passed during declared emergencies, were easy. Others, such as what frequency privileges and what modes are allowed, she learned strictly by memorization. These were no problem. My observation is that children of Kelly's age memorize much more easily than those of us in middle age.

The hardest material was electrical theory. How physical structure affects capacitance and inductance, or "What does this block diagram represent?" were the most difficult ideas to grasp. Again, we found that each type of question needed a different kind of approach. Easy ones, Kelly learned by reading, the memory ones she memorized, and the hard ones took some effort with books and real hands-on demonstrations with components and meters for her to understand.

Since Kelly had not had any real experience with electronics, she was not familiar with concepts such as resistors and capacitors, much less with what happens when resistors and capacitors are connected in series or parallel. I ended up buying a basic electronics laboratory kit from Radio Shack so I could show her how components looked and how basic circuits worked. At the very least, the electronics lab gave Kelly some intuition and insight into electronic components and circuits. She found that wiring up the circuits was enjoyable, although finding wiring errors was a pain when a circuit did not work.

Because of the amount of material to learn and the difficulty of remembering the answers to 360 questions, I contemplated a strategy of taking the test in two sessions. The first test for which we would concentrate on learning the material was Element 2a. Once that had been passed, we would concentrate on the material for Element 3. Kelly would take both elements at any test opportunity, but Element 3 would be strictly for practice, as we would not study that material.

Test Day

I had anticipated having Kelly take the test after several weeks of practice. Kelly, however, had different ideas. A test date was coming up at the local hospital testing site less than two weeks after we had started, and she wanted to go for it. Based on our reviews and practice tests, I knew she was not ready, but I did not want to discourage her from trying. It was a question of what would happen if we did not let her take it versus what would happen if she did take it and did not pass. Would it kill her enthusiasm? I hoped not.

Saturday morning arrived and we were up early. All the way to the testing site, I reviewed the harder questions with her and hoped she would remember the answers. Except for getting lost in the basement corridors and arriving a bit later than planned, all was ready. Kelly signed in and waited for her turn to test. And waited and waited. We had arrived at 8 a.m., but Kelly did not

get called until 10:30. Naturally, I tried to continue practice and drill, but she would have none of it. Instead, she read the paper, visited the gift shop, and chose snacks at the snack bar. Finally, the call came and Kelly took her place in the examination room. In less than 17 minutes she had turned in her paper and come out. "How do you think you did?" I inquired. "Well," she said, "I don't think I passed." I tried to say something encouraging, but yet wanted to prepare her in case she did fail. She seemed in pretty good spirits, but you could see that she was concerned. We waited and waited more.

Finally, Kelly could stand no more and went back into the exam room and asked the VEs how she had done. She came back looking disappointed and said that they told her she had not passed either element. I told her I would go confirm the results before

illustrate concepts while explaining the theory to one another. Kelly found that she could read five or 10 pages a night and still get in some computer practice within the allotted 30 minutes.

Second Test

By the end of the month, Kelly felt like a veteran. Her practice test scores were consistently in the 70% range, but I still felt she needed more practice. I asked if she would prefer to skip the test session and instead wait another month. "No," came the answer, so Saturday morning we trekked off to the hospital once again. This time we registered without incident and Kelly was called to take the test in short order. Again, in less than 20 minutes, she had finished and came out to wait for her score. This was about 9 a.m., or a little past. VEs kept bringing out certificates of completion and shaking hands with those who did not pass, but we were kept waiting. Finally, at 11:40, after almost everyone had left, Kelly received her certificate. She had passed. We were both elated.

Callsign

The FCC was telling everyone to anticipate a wait of about 12 weeks, but Kelly received her license in about eight. As a newly minted ham, KE6KJU, Kelly immediately got on our local 2 meter repeaters and found that a large group of new hams had all received their licenses within the last few days. Not only that, but Kelly is very popular on the air, probably a combination of being a YL and being a youngster. Since she has received her license, her cousin has expressed interest and vows that he, too, will earn his license.

Summary

So there you have it, the story of one young ham. It is possible to teach a youngster enough about electricity, electronics, and physics from scratch for them to pass the amateur radio examinations. But it takes dedication and perseverance from both the elmer and the student. Commercial materials help, but it still takes elbow grease and skull sweat to succeed.

Tips and Suggestions

1. Make the study sessions fun. Technical material is dull stuff to kids.
2. Do not overdo it. Half an hour at a time is plenty for most kids with normal concentration.
3. Use plenty of hands-on demonstrations.
4. Some kids respond best to visuals, so look for video study aids and materials with colorful graphic presentations.
5. Give plenty of positive feedback and encouragement.
6. Give them time to try to understand the technical things—be patient.

RF

Products Mentioned in this Article

ARRL Technician Class Exam Video Course

ARRL Technician Class Exam Course—Computerized exam review Published by American Radio Relay League, Newington, Connecticut 06111.

Nightsignals

Fire Watch

Hostage in the Woods

Novels by Cynthia Wall. Published by American Radio Relay League, Newington, Connecticut 06111.

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Capacitance Adapter CA-1

by Michael Jay Geier KB1UM

Have you ever needed to measure the value of a capacitor? Chances are, you have. If not, you will. That is, if you're at all into the technical side of this hobby, which I hope you are. Building and repairing equipment are two of the most interesting, valuable things you can get from ham radio. But why would you need to measure a capacitor? Aren't they all marked with their values?

Well, not all of them. If you tear up old boards for parts (another activity I hope you enjoy), you'll run across capacitors with cryptic or missing markings. Or, perhaps, you'll find a need to know the range of a trimcap (a small variable capacitor used for adjusting tuned circuits). What about the capacitance per foot of a piece of coaxial cable? Now and then that's a mighty handy thing to know. And, of course, you might just want to see if a marked capacitor is good. Any which way, the capability of measuring capacitance is very useful. Unfortunately, most low-cost digital voltmeters don't have capacitance settings. You can buy a capacitance meter, but it'll cost you at least \$60, and probably more like \$120. Wouldn't it be great if you could measure capacitors with the voltmeter you already have?

The Idea

Now you can! Actually, variations on this kit's circuit have been around for many years; I remember seeing something similar in an electronics magazine article about 15 years ago. The basic idea is to drive a pair of electronic switches with an oscillator. Then, using the unknown capacitor as a kind of time gate, you make its value determine how long the switches stay on during each cycle of the oscillator. The result is a series of pulses which varies in time length, also called "duty cycle," staying on longer for bigger capacitors and shorter for smaller ones. The relationship can be made very linear. In other words, if you double the capacitance, you double the time value. Finally, you average, or "integrate," the pulses with a filter (just another capacitor and a couple of resistors) into a DC voltage. The result is that the voltage rises and falls in direct step with the value of the unknown capacitor. Feed that voltage into your voltmeter, and you can read the value!

The Kit

It sounds more complicated than it is. To do it, you only need one chip and some as-

sorted and sundry components like diodes and resistors. But, to do it well, you need a good circuit design.

This kit uses a good design. Unlike some that require a four- or five-position range switch, this one can read from zero pF (picofarad) all the way to 2 μ F (microfarad) with only one range switch. Two μ F may not sound like much, but you'll find that nearly all unknown capacitors are well below that; above 2 μ F, caps are just about always electrolytic or tantalum, and well marked.

Before we get to performance, though, let's take a look at what it took to build the thing. The kit, purchased at Dayton, came in a small plastic bag. Included were all the parts, a predrilled, ready-to-stuff printed circuit board, and one sheet with the schematic, a pictorial diagram and instructions. If you've never built anything before, be warned: This is not a Heathkit-style project with detailed instructions on how to solder and a checklist for marking off each installed part. There are no silkscreened markings on the PC board, and the board is

der points were far enough apart that making bridges was not an issue.

There was one error in the kit. It was minor for an experienced hand like me, but it could trip up a newcomer. Capacitor C3, which is a tantalum, polarized type, did not have its polarity marked on the pictorial diagram. Nor is there any "+" or "-" on the schematic. The cap is right on the output of the voltage regulator. If you put it in backwards, it would most likely short as soon as you applied power, because tantalum caps will not tolerate reversed voltage. It might even damage the regulator. The proper polarity is with the "+" pointing toward R4, at the end of the board. I figured it out by noting that the output of the regulator was positive and ground was negative, and tracing them on the board. Rainbow really should fix this omission, though.

Tune 'Er Up

Now came the fun part. I had it all together and ready to test. I followed the calibration instructions, but, when they came

"You can buy a capacitance meter, but it'll cost you at least \$60, and probably more like \$120.

Wouldn't it be great if you could measure capacitors with the voltmeter you already have?"

not solder-masked to prevent bridges between traces. The instructions consist of a single paragraph that says things like "install the fixed resistors." Then again, Heathkits used to cost a lot more than what thirteen bucks is worth today.

Does that make it hard to put together? Not at all, assuming you know enough to be aware that a 390-pF cap might have a "391" marking. To their credit, Rainbow does call out the color code for each resistor. The most useful part of the assembly instructions is the pictorial diagram, which shows you where to put each part. For such a small kit, it's really all you need.

I put the kit together in about an hour, with no problems. All the parts where there, and there was even an extra resistor. At first I thought I had missed something, but a careful check of the parts list proved it to simply be an extra, evidently included by mistake. Into the junkie box it went! Although, as I mentioned, there is no solder-masking, the well-designed circuit board didn't really need it, because the sol-

der points were far enough apart that making bridges was not an issue. I found that there was no 1,000-pF cap! Tune-up requires two decent-quality reference capacitors, but neither is included. You can use any 1,000-pF and 1- μ F caps, but, if you don't have any, I recommend you go to Radio Shack and get their catalog numbers 272-126 (0.001 μ F, same as 1,000 pF) and 272-1434 (1 μ F tantalum). Total cost with tax is only about \$1.50, so the kit is still cheap. Of course, if you have a junkie box, you may not need to leave the house. Once I dug out some caps for calibration, the tune-up was a snap. It took only a couple of minutes, and went without a hitch. All you do is set one pot (potentiometer, or variable resistor) to make the meter read zero, and then set another to make the low range read your 1000-pF cap correctly. Finally, you set the high range to read your 1- μ F cap, and you're done.

How's It Work?

Great! Although not as accurate as a

full-blown digital capacitance meter, the Rainbow unit does the job. In fact, you can even match capacitors with it; several 1,200-pF units I had lying around came in with slightly different values. One read 1174, another 1210, both acceptable for the rated tolerances of these parts.

The kit runs on a 9-volt battery and doesn't take much current, so the battery should last a long time, making the use of an AC adapter unnecessary. The housing is up to you. Rainbow includes a nice set of terminals you can mount on your housing. They intend for them to be used for the input (to hold the unknown capacitor), but I elected to do it the other way around. I used a pair of short clip leads for the input and used the terminals for the output, making it easy to hook and unhook my meter. Be aware that if you do it that way your reading may vary by a couple of pF, due to the capacitance of the clip leads changing with their position. Unless you're working with the tiny capacitance values found in UHF circuits, though, it shouldn't be a problem. Even when I tried measuring some very low-value caps, around 7 pF, the instrument was still within 1 or 2 pF at all times. Not bad for a \$13 kit!

This circuit doesn't amplify, or "buffer," its output before it goes to the meter. That keeps the cost down and the accuracy up. Used as intended with a high-impedance device like a digital meter, there's plenty of current for accurate measurements. If you tried to connect the kit to a 20K-ohms-per-volt analog meter, though, you'd get some very bad readings.

Conclusion

When I stuffed the board, I elected not to use the included chip socket, because sockets can cause long-term reliability problems in any circuit. In retrospect, I think it was a mistake. There's no protection of any kind on this kit's input. If you connect a charged capacitor to it, you'll very likely blow the 74HC132 chip. That part is worth about one dollar, so, as long as you use the socket, replacing it is trivial. In my case, it's gonna be a desoldering nightmare. If I had it to do over again, I'd use the socket.

This is an excellent product at a low cost. Rainbow also makes an inductance adapter, and I now wish I'd bought that one, too. If you have a digital meter and are getting into homebrewing or repairing equipment, you might want to give this thing a try. For the money, you can't go wrong!

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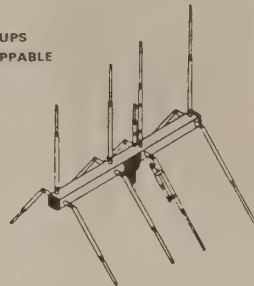
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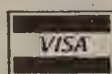
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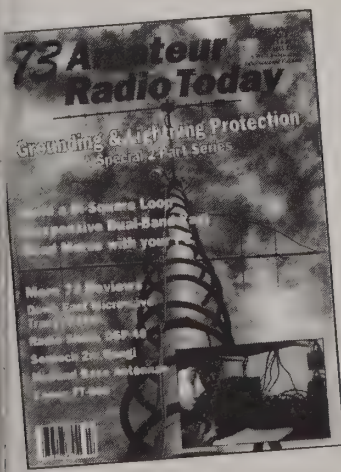
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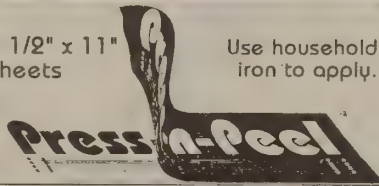
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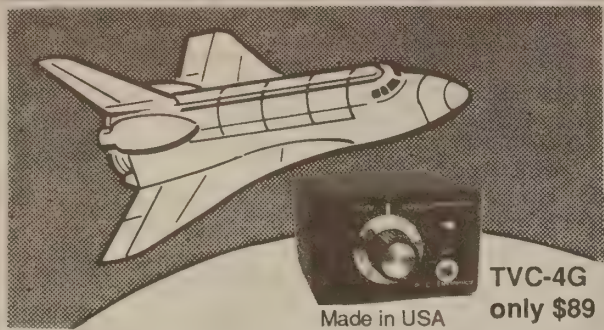
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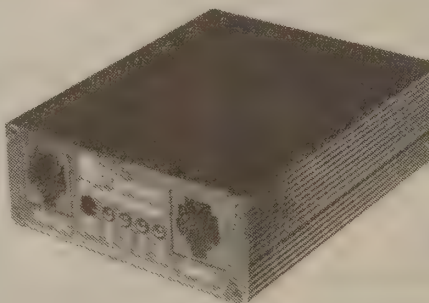
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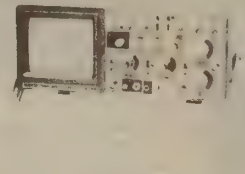
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Sporadic-"E" Spells Excitement

Radio fireworks in the sky.

by Gordon West WB6NOA

Welcome to July and the summertime season for radio fireworks in the ionosphere. Get set to tune in radio signals coming in over 1,000 miles where you normally only hear radio calls under 40 miles. Whether you are a scanner radio enthusiast, or a licensed amateur operator, or maybe into television DX (distant station) reception, July is your prime month for a peak in sporadic-E ionospheric skip.

Reflective E-Layer Clouds

Long-range radio reception and transmissions on "line of sight" frequencies are a function of the E-layer within the ionosphere. Every day, the E-layer forms up to blanket us with a thin film of supercharged electrons, but only during the months of June, July, and August does the E-layer become so intense that it refracts VHF signals back to earth well over 1,000 miles away.

E-layer ionospheric skip affects the following ham bands: 20 meters, 17 meters, 15 meters, 12 meters, 10 meters, 6 meters, 2 meters (rarely), 1-1/4 meters (extremely rarely).

Television signals are also affected by E-layer skip, affecting TV channels 2 through 6 when tuned in with an outside antenna. You may sometimes see cable television signals affected by E-layer skip when the cable system uses an outside antenna to bring these stations in from a distant transmitting site.

Scanner enthusiasts will find plenty of excitement on low band, 30-50 MHz, and with a wide-band receiver can tune in to FM broadcast sporadic-E reception when conditions get intense.

The ionospheric E-layer is only present during daylight hours. It forms up as the sun bombards the ionosphere with ultraviolet radiation. During the summer months, ultraviolet radiation intensifies and gives

the E-layer an extra kick or two when it comes to getting a natural charge. With predictable regularity, the E-layer breaks up into highly ionized patches of sporadic-E clouds, and these sporadic-E clouds of intense ionization drift from west to east in the natural cosmic winds that surround the earth.

Radio signals, which normally travel in straight lines and seldom bounce off of the regular ionospheric layers, may strike a sporadic-E cloud and refract and reflect back to earth hundreds of miles away. Some of these refractions and reflections are so strong that incoming signals skipped off of a sporadic-E cloud are just as strong as if you were a few miles away from the transmitting station, rather than a few hundred miles away.

High altitude wind shears may also contribute to ionized patches of sporadic-E activity. While wind shears at high altitudes are thought to be a contributing factor of sporadic-E skip communications on high frequencies and VHF, most experts agree that it is the wind shear combined with summertime sporadic-E clouds that contribute to extraordinary reception on normally line-of-sight frequencies.

Thunderstorms and tornados can also create patches of highly ionized clouds which can reflect and refract radio signals. Watching the weather maps can clue you in on where a sporadic-E cloud may be located.

For skip communications to take place between two stations, the sporadic-E cloud needs to be equidistant between you and the other station. The more intense the sporadic-E cloud, the higher the maximum frequency of transmission and reception. The world's record hovers around 223 MHz.

On the 2 meter amateur radio band between 144 MHz and 148 MHz, there may be 10 to 15 sporadic-E short-skip openings during the summer months that will last only for about 5 minutes each. On the FM music band, you may get as many as 20 to 25 openings that might last a half-hour each during the summer months. And down on the amateur radio 6 meter band between 50 MHz and 54 MHz, you might get as many as 30 openings during the summer months, lasting for as long as 2 or 3 hours each. Most sporadic-E openings occur in the late afternoon and early evening hours, just as you are coming home from work. Never do they occur in the dead of the night unless you are treated to that extra spectacular event called the aurora. When you see an aurora in the northern latitudes, you can certainly expect sporadic-E short-skip openings.

The three-month period in June, July, and August is the prime season for sporadic-E. Sporadic-E is not dependent on the solar cycle, so don't think you're going to miss a summer of sporadic-E just because we're at the very bottom of solar cycle 22. Some folks feel that there may be increased sporadic-E activity at the bottom of the solar cycle.

If you are a ham, tune the 10 meter ham band for activity. Tune from 28.200 to 28.300 and listen for the many CW propagation beacons that pop up out of nowhere when the band "opens." Then tune the voice portion of the band and see where the signals are coming from. This points to the direction of the sporadic-E cloud. If conditions on the 10 meter ham band begin to shorten up between you and the receive station to no more than 300 miles away, there is an almost simultaneous sporadic-E event occurring up on the amateur

radio 6 meter band from 50 MHz to 54 MHz.

When 50 MHz-54 MHz shortens up to about 600 miles away, begin to tune higher for a possible opening on the 2 meter band. When 6 meter signals shorten up to 400 miles away, you can expect that the 2 meter band will magically open up for sporadic-E short-skip communications. Enjoy, but don't expect 2 meter band openings to last for more than a couple of minutes.

Check the Weather

Predicting sporadic-E activity on a daily basis is truly impossible. Tuning in WWV on shortwave at 5 MHz, 10 MHz, and 15 MHz may sometimes give you a clue on the activity of the ionosphere. If they predict "major storms," you can sometimes anticipate sporadic-E. Predicting the days of sporadic-E during June, July, and August would be as difficult as trying to predict when you could see an aurora. They're really almost the same thing.

Detecting the opening of a band on amateur radio frequencies when sporadic-E becomes so intense as to affect those VHF bands is like playing detective—you look for clues:

- Skip conditions on 10 meters (28 MHz) shortening from 1,000 miles down to 400 miles,
- Zzzttttssss sounds causing 6 meter background noise to snap, crackle, and pop,
- Bands of horizontal interference bars overriding television channel 2, going from bottom to top every 5 seconds,
- An FM stereo receiver picking up stations on normally vacant frequencies,
- The presence of extremely strong

Continued on page 26

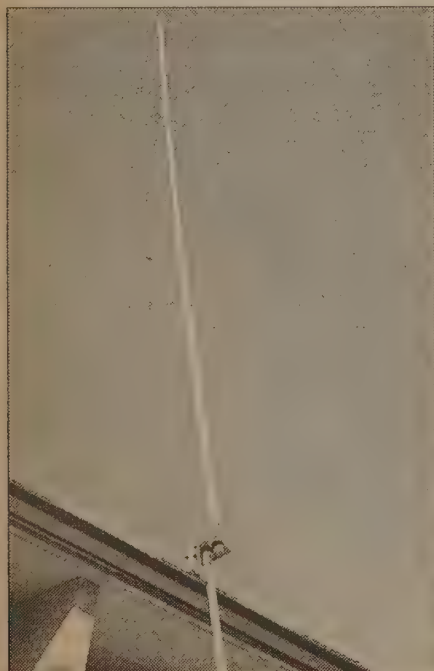


Photo A. Six meter verticals can work into E-skip with good results.

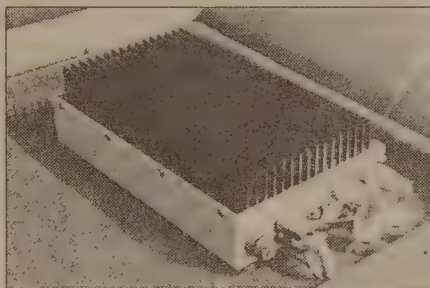


Photo B. VHF 6 meter mobile 12-volt amplifiers require plenty of power and plenty of ventilation.



Photo C. New 100-channel Alinco 6 meter FM 10-watt mobile transceiver easily works sporadic-E skip.

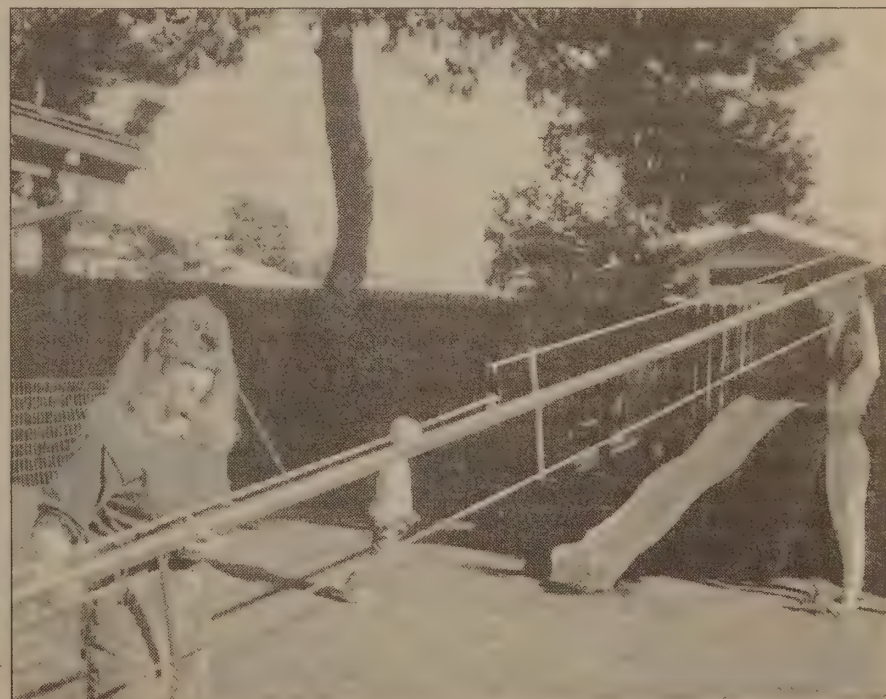


Photo D. A monster vertical HF antenna with 6 meter capabilities goes up for sporadic-E summertime contacts.

HF Skywave Propagation

by Dave Miller NZ9E

Most people, especially when they're first starting out, probably don't really want long drawn-out textbook explanations of radio signal propagation theory. They just want to know if they'll be hearing any DX today or tomorrow to help pick up a couple of "new ones" for their DXCC certificate, or if they'll have a reasonable chance of talking to their friend in some faraway spot.

Understanding the factors that influence how well our signals travel or *propagate* around the globe is a complicated matter, isn't it? Yes, it is—not even all of the experts agree on the specifics—but we *can* understand the basics of what's important and how to roughly predict when HF shortwave conditions will be reasonably good or essentially poor, and not get too deeply into quantum mechanics and other theoretical exercises. There are really only a few factors to keep in mind to accomplish this, and it isn't all that tough.

Propagation Factors

We won't be getting deeply into the concepts of MUF (Maximum Usable Frequency), LUF (Lowest Usable Frequency), Optimum Frequency, Critical Frequency, etc. Although these are all worthwhile concepts to know and, hopefully, to be able to ascertain at any given instant in time, they're beyond the scope of this article's promise as *simplified*. Very brief explanations of them are given in the sidebar that accompanies this article for those who might want to go a little bit deeper.

As a brief refresher, shortwave radio signals are propagated to nearby receivers via *ground waves* and to more distant locations—over 100 miles away—through their interaction with the ionosphere (that's what we call *skywaves*). They can be *reflected* by the ionosphere, *refracted* by it, or *ducted* for some distance within it and then bent back to earth, all by their interaction with the ionized layer above our planet that's known as the ionosphere.

The ionosphere always seems to be there, in one form or another; it's just that at times it's a better *propagation medium* than at other times. That's an important point to keep in mind.

Sunspots and Solar Flares

We all know that there are good times for radio signal propagation, and there are bad times. The good times occur mostly when we find ourselves at the sunspot maximum; i.e., when the 11-year sunspot cycle is at its peak number of spots. Alternately, the worst times for propagation are when the sunspot cycle is at its ebb—fewer spots on the sun. These are the basics of the 11-year cycles, but there is a bit more to it than that—nothing particularly difficult to remember, though.

Here, then, is the first thing to keep in

mind: *Sun spots are good news*. And, the second thing to remember: *Solar flares are bad news*.

Spots and flares are completely different animals, though they're sometimes interrelated. But it's important to remember that spots are good, flares are bad.

Sunspots are just that, spots or blemishes on the sun's surface that come and go without complete predictability, but that occur much more often during what we call the *peak* of the 11-year sunspot cycle. Sunspots produce low energy X-rays and ultraviolet radiation that fuels the development of the ionosphere, thus making it a better medium for propagating our HF shortwave signals. That's why I termed them as *good*. In general, the greater the number of sunspots, the better amateur HF radio propagation will

higher frequency bands can become unusable for long-distance communications.

Propagation Forecasts

You can follow these solar "events," and their effects on our ionosphere, in a couple of different ways. Perhaps the easiest for the beginner would be to listen to the ARRL propagation forecasts on WIAW. Current and near-future expected propagation conditions, as well as solar flare alerts, are broadcast over the ARRL's bulletin station, WIAW, daily. Another approach would be to listen to the National Bureau of Science and Technology's radio station WWV, at 18 minutes after each hour, for their radio propagation forecast and magnetic storm report.

When you first hear the WWV propaga-

*“... the first thing to keep in mind:
Sun spots are good news.
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be. Additionally, the more spots, the higher the usable frequency will be—10 meters can be a great international band during the sunspot maxima.

Solar flares, on the other hand, produce high energy X-rays and high energy proton clouds that can disrupt the formation and/or the stability of the ionosphere, so they're *bad* for propagation. There's much more to the actual physics of it than just these relatively simple descriptions imply, but that's really all you need to keep in mind for right now. You're welcome to explore the process more deeply, of course, but again, I promised that this would be a simplified approach. One other thing you should know: Flares also upset the earth's magnetic field to some extent, because the proton cloud created by the flare carries with it some of the sun's own magnetic field. When that cloud reaches earth, it will have varying degrees of effects on our normal magnetic field; thus it's the source of what we term *magnetic storms*. The severity of the magnetic storm produced by this proton cloud—or solar wind—can create HF radio propagation disruptions that vary from minor to major levels, because the uniformity in the formation of the ionosphere is dependent upon the stability in the earth's magnetic field. During times of high sunspot numbers, a solar flare may not cause big, long-lasting disruptions in the ionosphere—because of the higher ionization levels at that time—but in times of low sunspot activity, it's effect can be very noticeable. Amateur HF propagation paths can be shortened considerably and the

tion forecast figures, you'll find that they're somewhat cryptic in their content, but after awhile you'll begin to get more and more out of the information that they contain. WWV will mention a current "solar flux level," a solar activity summation ("very low," "low," "moderate," "high," or "very high") an "A" index and a "K" index. They'll also give a "geomagnetic field" activity report such as "quiet," "unsettled," or "active." If a geomagnetic storm is in progress, they will tell you if it's minor or major. I'll try to give you a brief, non-technical description of what those terms mean to us as hams looking for some DX. Again, this is a practical, rather than an in-depth, treatment of the information to be found on WWV.

First, the solar flux levels, or *solar flux index*, as it's called. This is a measure of how much *good energy* is being radiated by the sun to act as fuel for the ionosphere—good from a radio propagation point of view, at least. The higher these levels are, the better. During a sunspot maximum, the solar flux index will go up to 200 or beyond, whereas during the ebb of the sunspot cycle it may drop into the 60s. The solar flux index provides a rough benchmark of where we are in the 11-year sunspot cycle and whether there is enough of the *good* solar radiation to support long-distance communications circuits. Now, having said that, it isn't always true! Solar flares, the bad guys, will also inflate the solar flux index, so you should listen to the rest of the report as well. There's always a catch, it seems.

Next is the "K" index; I'm skipping the "A" index because the "K" index generally tells you more of what you'll need to know from a practical standpoint. The "K" index is a measure of the earth's general magnetic field activity, and a low number is best for radio propagation. A "K" index of zero or 1 means that there is little outside disturbance to the earth's normal magnetic field—good news. A "K" index of 3, 4, or higher indicates that a flare has probably occurred and that the earth's magnetic field and the ionosphere are both in for a rough time for a while. Long-distance communications may be disrupted or greatly curtailed during high "K" index times. By the way, high "K" indices can make for some interesting localized propagation conditions; you may be able to work closer-in states that you're normally unable to hear on certain bands. So don't give up and turn off the radio completely—it may be a good opportunity to fill in some blank spots on your all-band WAS certificate application.

You'll also be told that the geomagnetic field is in "minor storm" or "major storm" conditions when you hear a high "K" index announced. That gives you some idea of the extent of disruption and perhaps how long you can expect it to go on. They will also give a prediction for the next 24 hours, and that will probably reinforce your own conclusions from the past 24-hour figures. Once you become used to listening to WWV propagation forecasts, you actually will have the ability to draw some meaningful conclusions.

Here's something else that's kind of interesting: The sun rotates—turns around—at about a 27- to 28-day cycle (the sun doesn't rotate as nicely and neatly as a solid mass like our earth does). This means, however, that disturbances on its surface will face the earth for several days each 27 or 28 days, if those disturbances are of a long-lasting nature. Long-lived flares, especially when we're at the ebb of the sunspot cycle, will come around to play havoc with our ionosphere roughly once a month, so you can sometimes time your QSO schedules around them.

"Great," you might be thinking, "but what does this tell me about whether or not I can keep my sked today with my friend in California?" After you get used to listening to the WWV reports and reading the ARRL propagation bulletins, it will probably tell you a lot. You'll begin to get a feel for how well a particular circuit will work, partly from other times you've talked successfully with your friend under certain solar flux and "K" index conditions, and partly from the numbers themselves. Nothing and no one can guarantee you'll have a good QSO today with California, just as no one can

Continued on page 26



the tech side

by Michael Jay Geier KB1UM

Buttons, Buttons, Everywhere

For the past few months, we've been exploring the operation of a modern amateur HT (handheld transceiver), or "walkie" as we like to call it. Let's see if we can finish that up:

Find Me!

One of the nicer features on modern walkies is their ability to scan. If you've ever owned a scanner, you know how that works. If not, the concept may be a little alien, so let's take a look at it. On an HT there are two basic ways to scan: You can scan the memory channels you've already entered, or you can scan the band, looking for activity on new frequencies. Scanning is often as easy as pressing a single button, but that may get you into something you don't want; you may find yourself scanning way up the band, especially on wide-band radios which cover frequencies far outside of the ham band. If you want to listen for active 2 meter ham frequencies, you sure don't want the rig up at 160 MHz! Even at the rather rapid scan rate of most of today's radios, it can take several minutes to go all the way around, and even more if the radio stops on several frequencies to listen to signals, which it almost certainly will. To overcome that problem, there's usually a provision to select the scan limits, ensuring that the radio will stay within whatever portion of its range you select. Entering the limit frequencies is just like entering any other memory data, except that you don't have to worry about offset, CTCSS, and the like. Only the frequency matters. On all the radios I've had, you just enter those frequencies into two special-purpose memories, and then select the limited-scan mode through some sequence of key presses. The radio will start scanning, starting with the lower limit frequency you've entered into the first special-purpose memory. When it gets to the frequency in the second memory, it'll loop back around to the first one and start all over again.

Most walkies let you select from a couple of options regarding what happens when the radio finds a signal. Basically there are three things that can happen; the rig can stop until the signal goes away, it can pause for a few seconds and then resume, regardless of whether the signal is still there, or it can stop and stay stopped.

The first two options are probably the most useful ones. I find them both handy, depending on what I'm trying to listen to. For scanning ham repeaters, I usually use the pause, because many hams are fairly long-winded, and I don't want the radio to stay on one signal so long that I miss half a

dozen others. If I like what I'm hearing, I can always stop the scan myself. For listening to public service signals such as police and fire, though, I usually use the "stop until it goes away" mode. That way, I don't miss vital information, and most transmissions are pretty short anyway.

Some radios let you scan the memories in banks, so you can put, say, your aircraft frequencies in one and your ham repeaters in another, scanning only the ones you're in the mood to hear. I have a new HT which does that, and I'm finding it more useful than I expected.

There's one other kind of scanning which really comes in handy. It's called "priority watch," and it's great when you're

"For scanning ham repeaters, I usually use the pause, because many hams are fairly long-winded, and I don't want the radio to stay on one signal so long that I miss half a dozen others."

waiting for a call from a friend but want to use the rig on other frequencies while you wait. You just set the priority memory to your friend's frequency and then turn on the priority function. Now you can go to your other frequencies and your radio will go back and check the priority memory every few seconds, looking for activity. If it finds a signal, it stops on the priority frequency. If not, it goes back to where you were. Although the radio checks the priority frequency pretty fast, it does make a glitch in your receive audio, which can be annoying. Also, it won't go check while you're transmitting, so you could miss your friend's call if you talk a lot. Still, priority watch is a very useful function.

Hide and Seek

Some signals, such as the NOAA weather channel, are on all the time. So, scanning them will make the radio stop every time it gets to them. Others, like a local police channel in a busy city, are on so much that you may get tired of their stopping your scan, especially if you use the "wait until the signal stops" mode. With frequencies like that, or with any other frequencies you just don't want to scan, what you really need is a way to keep them in memory but make the scanner pass over them. Luckily, there's a way to do that. Most radios call it "skip." It's simply a marker you can put in memory, along with the frequency and other memory contents, which will cause the memory to be skipped during the scan. As far as I know, all newer HTs have this

function, although some do it the other way around: You have to mark the memories you *do* want to scan, and all unmarked memories are skipped. Some rigs even let you hide memories altogether. Hiding a memory is the same as erasing it, with the exception that you can get it back later. Why do that? It isn't strictly necessary, but it can be nice to make whole groups of memories go away. Especially if you travel to the same places over and over, you may want to keep repeaters for other localities in memory all the time, keeping them hidden when you're not in those cities. That helps avoid confusion as to which frequencies are for which areas. Also, if your rig doesn't have the ability to scan memories

that, themselves, require tone, because your encoder is then tied up opening up the repeater, and all users will be sending the same tone, defeating the selective calling aspect.

Outside Looking In

Let's say you're in a new area, and you hear a local repeater. You'd like to join in, but, when you key up, you don't open the repeater, even though it's coming in at full scale on your S meter. You figure you must be getting to the machine, so why doesn't it hear you? Chances are, it requires a tone. That doesn't mean that anyone wants to keep newcomers out; most likely, the tone squelch was turned on to avoid mutual interference with another repeater, or to stop the machine's being opened up by some extraneous signal such as intermod from a commercial service. If you could only ask, the other users would be glad to tell you the tone frequency, but of course, you can't ask because they can't hear you! What's a frustrated ham to do?

If you have a tone decoder, you can turn it on and start stepping through the tones until your own receiver opens up. When it does, you've found the tone, and can program it into your encoder. Now they'll hear you! This assumes that the repeater sends out the tone. Most do, but a few will not, making this method useless.

Some newer HTs will even scan the tones for you, stopping when they find the one that opens up the receiver. You may notice that they don't do that real fast; it takes a good fraction of a second for the decoder to lock onto the tone and open up. So, if you have to do it manually, don't whiz through the tones or you may pass right over the correct one, never knowing it because you didn't give the decoder enough time to do its job.

Once you find the tone, you probably will want to save it, and the tone encoder's "on" status, into the same memory that holds the frequency. On most walkies, you just recall the frequency, set up the tone information and then resave the memory. On some, you don't even have to do that—the radio automatically saves into the memory any changes you make. I prefer having to do my own resave, so that I can make temporary changes and not mess up the memory contents. As long as you remember to set things back the way you want them, though, either system will work fine.

Well, I hoped we would wrap this topic up, but there's still more! Next time, we'll look at some of the fancier features on today's amazing little walkies. Until then, 73 from KB1UM.

At the Tone . . .

The widespread use of CTCSS (continuous tone-coded squelch system) on amateur repeaters these days has led to just about all new walkies including a tone encoder. Many also include a decoder. Why do you need that? Well, usually you don't but it can come in handy. Probably the most common use for a tone decoder is with repeaters that *don't* use CTCSS tones! What you do is have your friend set his or her rig up to send and receive tones, and you put yours on the same tone frequency, with the same setup. Then, you don't have to listen to repeater chatter, but your friend's signal will open your squelch. It's a simple, effective selective calling system, but there are a few things to watch out for. First, it's really easy to interfere with others on the repeater, because you forget you can't hear them and start talking over them. Second, you often must use one of the higher tones, because many repeaters can't pass the lower audio frequencies, preventing your friend's tone from getting to you and opening your squelch. Third, don't forget: you're sending tones and limiting your own receiver to tone-encoded signals in no way prevents others from hearing you, and does not create any kind of a private channel.

You can't use this system on repeaters

Say You Saw It In **Radio Fun**

JULY 1995

RF

21



Joe Carr

antennas, etc.

Vertical Antennas—Part 1

by Joseph J. Carr K4IPV

Polarity and Orientation

Radio signals are transverse electromagnetic waves that consist of an electrical field and a magnetic field propagating in the same direction, but oriented at right angles to each other. When we speak of the "polarization" of the radio wave we are speaking of the orientation of the electrical (or "E") field. A horizontally polarized signal has its E-field horizontal with respect to the Earth's surface, while a vertically polarized antenna has its E-field oriented vertical with respect to the Earth's surface. The direction of the electric field, which sets the polarity of the antenna (Figure 1), is a function of the geometry of the radiator element. If the element is vertical (Figure 1A), then the antenna polarity is also vertical (E-field vectors perpendicular to the ground. The signal propagates outward from the radiator in all directions of azimuth, making this antenna an "omnidirectional" radiator. If the antenna is oriented horizontally (Figure 1B), then the electric field is parallel to the ground.

Figure 2 shows the basic geometry of the vertical antenna: an RF generator (transmitter or coaxial transmission line from a transmitter) at the base of a vertically oriented radiator of length L . Although most commonly encountered verticals are quarter-wavelength ($L = \lambda/4$), that length is not the only permissible length. In fact, it may not even be the most desirable length. In this article we will talk about the standard quarter-

wavelength vertical antenna (because it is so popular), but also will deal with other length verticals (both greater and less than quarter-wavelength).

The quarter-wavelength vertical antenna is basically half a dipole placed vertically, with the "other half" of the dipole being the ground. Because of this fact, some texts show the vertical with a dotted line "ghost" or "virtual" radiator in the earth beneath the main antenna element.

Like the dipole, the quarter-wavelength vertical is fed at a current node, so the feedpoint impedance is at a minimum (typically 2 to 37 ohms, depending upon conditions). As a result, the current is maximum and the voltage is minimum at the feedpoint. However, not all vertical antennas are fed directly at the current node, and as a result, some designs require antenna tuning units to make them match the antenna impedance to the transmitter output impedance.

The radiator element is mounted at ground level, but is insulated from ground. Because the antenna shown is quarter-wavelength, it is fed at a current node with 52-ohm coaxial cable. The inner conductor of the coaxial cable is connected to the radiator element, while the coaxial cable shield is connected to the ground. As you will see shortly, the ground system for the vertical antenna is critical to its performance. Normally, the feedpoint impedance is not exactly 52 ohms, but rather is somewhat lower. As a result, without some matching there will be a slight VSWR, but in most cases the VSWR is a tolerable tradeoff for simplicity. If the antenna has a feedpoint impedance of 37 ohms, which is the value usually quoted, then the VSWR will be 52 ohms/37 ohms, or 1.41:1.

Grounds for Thought

Two "grounds" are shown in Figure 2. One is the standard earth ground (as indicated by the ground symbol). This ground is usually one or more 6- to 8-foot copper or copper-clad steel pipes designed especially for ground rod service. The other "ground" is an artificial or "counterpoise" ground con-

sisting of a set of quarter-wavelength radials. These radials are usually made of #14 antenna wire. In general, at least two radials are required for each band, and even that number is marginal. The standard wisdom holds that the greater the number of radials, the better the performance. While that statement is true, there are both theoretical and practical limits to the number of radials. The theoretical limit is derived from the fact that more than 120 radials returns practically no increase in operation effectiveness, and at more than 16 radials the returned added effectiveness per new radial is less than is the case for fewer radials. That is, going from 16 to 32 radials (doubling the number) creates less an increase in received field strength at a distant point than going from 8 to 16 radials (both represent doubling the density of the radial system). I've had good success with 4-radial counterpoise ground systems, so don't go ballistic if you can't place more.

The radials can be either mounted on the ground or buried. Be careful if the radials are not buried, however, as they are a hazard to foot traffic in the area!

A vertical mounted above the ground level is shown in Figure 3. This antenna is equal in popularity with the ground-mounted. Amateurs find it easy to construct this form of antenna because the lightweight vertical can be mounted at reasonable heights (15 to 50 feet) using television antenna slip-up telescoping masts, which are reasonably low in cost. A problem with the non-ground-level vertical antenna is that there is no easy way to connect it to ground unless the mast is metal, and that is marginal (and indeed, may not work at all if the mast length is wrong!). The solution to the problem is to create a counterpoise ground with a system of quarter-wavelength radials.

The radials of the off-ground-level vertical antenna can be at any angle. In Figure 3 they are "drooping radials," i.e., the angle is greater than 90 degrees relative to the vertical radiator element. We might also see a vertical antenna that is equipped with radials

at exactly 90 degrees with respect to the radiator element. These antennas are sometimes called *Ground Plane Vertical Antennas*.

Antenna Materials

The materials used to construct verticals are as varied as one's resources. For example, if appropriate supports are provided, then ordinary #14 copper or copper-clad antenna wire can be used to make the vertical. A lot of verticals are built from 0.75- to 3.00-inch diameter aluminum tubing. I've even seen metal irrigation pipe used for an HF vertical. One popular approach is to use PVC plastic pipe with wires run vertically on the inside. The advantage of this approach is that, if the wires are insulated, then several bands can be covered by running several wires, each cut to the proper length for its band. A disadvantage of the PVC approach is that PVC piping, except for the larger diameter, thick-wall varieties, doesn't stand up on end very easily . . . it tends to bend over.

SAFETY NOTE. Vertical antennas are long, so can reach high into the air. They also tend to be lightweight, so even relatively weak people are tempted to mount them by themselves. That's a good way to strain a muscle, at the very least. Of more importance, however, is that the antenna is likely to get away from a single installer and fall over. The fall might hurt someone, or the antenna might be damaged. If the antenna falls against a power line, then the installer might be killed. Only a few days before I wrote this month's column I saw an item in the press about a ham operator who was killed installing an antenna . . . *it really happens!*

Rule: Don't install a vertical antenna at any location where it may fall and hit telephone or power lines.

And one further rule: *Don't even think about installing a vertical antenna, especially on a roof, when the wind is blowing!*

Next Month . . .

Next month we will finish our discussion of vertical antennas. RF

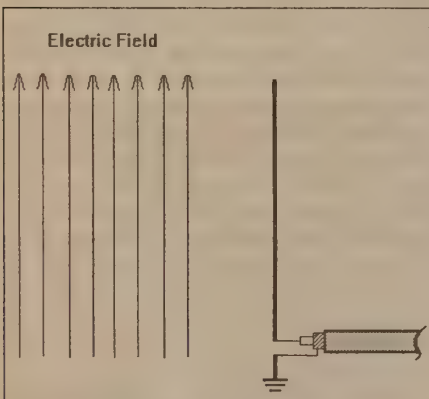


Figure 1A. A vertically oriented antenna.

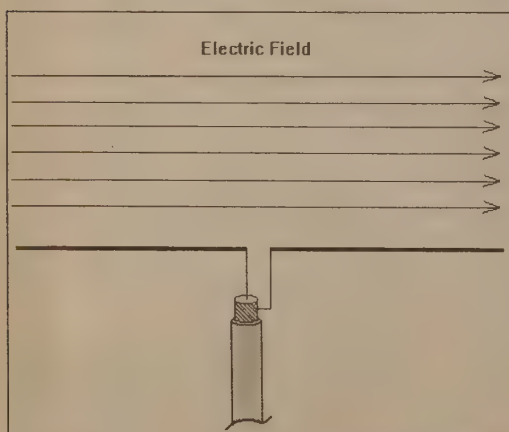


Figure 1B. A horizontally oriented antenna.

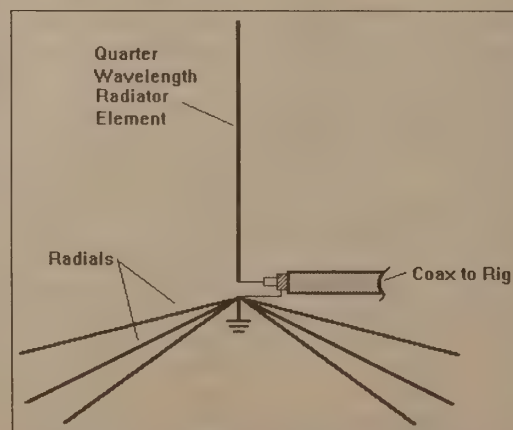


Figure 2. A vertically oriented antenna showing "ground" and radials.

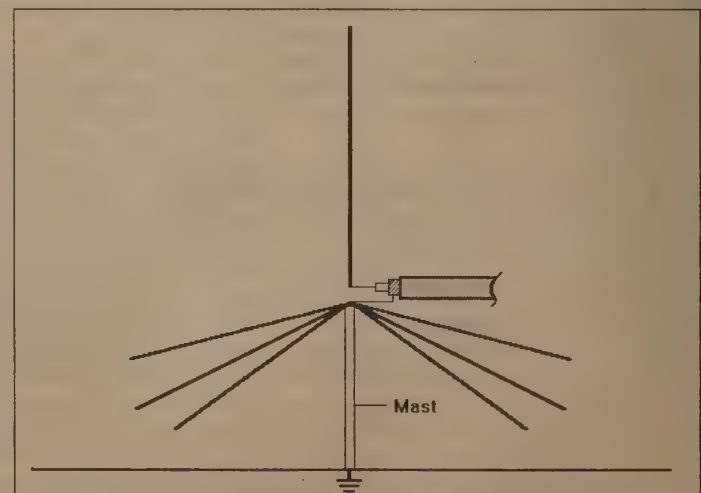


Figure 3. Off-ground radials can be more than 90 degrees from the main element—"drooping radials."



radio magic

by Michael Bryce WB8VGE

In ham radio, as in most other hobbies, there are many sub-hobbies that may interest you. Running low-power radios with the sun's energy has always been of great interest to me. This month, I would like to start a small run on alternate energy for use in your shack.

My Solar Panel

I'll start out by telling you how to repair a very popular solar panel. Although this panel is no longer being made, it is still available on the surplus market. In its heyday, it retailed for about \$500. I'm talking about the Arco 16-2000 module. The module name says it all. The 16-2000 produces 2,000 mA at 16 volts, or about 32 watts. Today, a 75-watt panel may be purchased for \$425. So yes, the price of solar power is slowly dropping.

It's been said that hindsight is always 20-20. I'm not sure if that's entirely true, but for years I've been wanting to bolt down one of my old Arco 16-2000 photovoltaic panels to the array frame. It would only take a few minutes, and four bolts, but I just never seem to find the time to get the job done. Besides, the wind always blows from the south or southwest, pushing the panel down on the array frame. It's not going anywhere!

Until the blizzard of '93, that is. When a massive low-pressure center started to grow in the Gulf, we were told by the National Weather Service a really nasty storm would be coming our way. I never gave much thought to bolting down the panel; besides, it had been sitting there for years. However, when the storm approached the eastern half of Ohio, the winds started to blow. Wind gusts up to 50 mph hit my neck of the woods. To make matters much worse, this time the winds were coming out of the north and northeast.

I decided to go out and brush the snow off the array before the bulk of the storm hit. I found a panel lying face down in a snow drift. Wouldn't you know that it was the very top panel, the one *not* bolted down to the array frame. The wind came up under the mount and tore the terminal studs right off the panel. Looking up, I saw the terminal studs, hanging from two wires, blowing in the wind.

After saying a few dozen nasty words, I picked up the panel and brought it in the house for a closer examination. It seemed to be untouched, except for the electrical terminals being snapped off. I had two choices: Either trash the panel or try to fix it. I figured I couldn't damage it more, so I decided to try and repair the panel. If you ever have to repair a 16-2000, you might find this lesson valuable.

Repairing the 16-2000

The 16-2000 has one terminal on each end. The terminal connects the positive and negative leads of the PV cells to the

outside world. Since everything else looked fine, I only had to reconnect the terminals to the panel. Looking at the back side of the panel, I saw that the terminals seemed to be soldered to a large metal plate. Only a small portion of this plate can be seen from the back side. It's about the size of a quarter and covered with silicone sealer. You can see the plate only where the terminal stud was attached.

Each terminal has a plastic shoulder over it to seal the connection between the back of the panel and the terminal stud. A glob of silicone made a watertight seal. The terminals needed to be cleaned up before they could be used again. This meant removing any remaining silicone from the stud and cleaning the stud to allow solder to flow easily.

The second step required the use of a flat sharp knife to remove the remaining silicone from the area where the terminal used to be on the back of the panel. The only thing separating the elements from the PV cells is a very thin layer of EVA polymer. Cutting into the EVA would al-

Before I started to resolder the terminal to the panel, I removed as much of the old solder as I could using a solder sucker. I wanted the surface to be nice and shiny with a new coat of solder. Also, I needed to have the surface flat in order to keep the terminal straight when I resoldered it in.

Using the hair dryer to heat up the glass, I carefully placed the terminal stud on the plate. Next, I placed several sheets of scrap aluminum around the area I was working on, to prevent damage from the propane torch. You can see the propane torch flame come out of the sides of the soldering tip attachment. I placed the terminal stud on the plate and took the propane torch and held its tip to the top of the stud. It is extremely important not to get solder inside the threads of the terminal strip. The soldering iron heated up the bottom of the terminal stud to the point that the solder melted and flowed freely. I placed a bead of solder all the way around the stud. Removing the propane torch first and then the soldering iron proved the best method in preventing the stud from moving until the solder cooled. The hair dryer was the last to be removed.

After both terminal studs had been reconnected to the panel, a voltage check was in order. Since a PV panel is a constant voltage source, all you have to do is expose the panel to a bright source of light to produce voltage. A 40-watt "shop" light works well for testing the 16-2000 panel. It's just long enough and wide enough to completely cover the front of the panel. Place the panel up to the light and watch your VOM connected to the terminals for signs of life. In my case, the panel produced 20 volts. It seemed my repair worked.

After making sure the terminal studs had cooled and had been completely soldered all the way around, it was time to install the plastic shoulders and seal the area. I did this by placing a generous amount of clear silicone sealer around the terminal stud. Next, I pressed the shoulder down on the terminal stud, thus pushing out the excess silicone. After completing both terminals, I laid aside the entire panel until the silicon cured, which took about 24 hours.

Before I reinstalled the panel, I did another voltage test, this time during a cold March day. The panel produced rated open circuit voltage and short-circuit current. The next day, I reinstalled the panel in the array mount.

So before you give up on a broken 16-2000 panel, follow the steps described above and save yourself some money and grief. And in case you're wondering if I bolted the panel to the array this time... nope. It's too much work, but I do have two-vise grip pliers holding it down. Besides, the wind always blows from the west.

QUADS

6 Meter	2 Element	\$59.95
2 Meter	2 Element	\$29.95
2 Meter	4 Element	\$39.95
2 Meter	6 Element	\$59.95
2 Meter	10 Element	\$99.95
70 CM	4 Element	\$29.95
70 CM	7 Element	\$49.95
70 CM	12 Element	\$69.95

Use a Quad to see what fun you can have!

Dual Band on one boom!

6 Meter	2 Element	2 Meter	4 Element	\$89.95
2 Meter	2 Element	70 CM	4 Element	\$49.95
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what's next?

by Carole Perry WB2MGP

Teaching The Teachers

One of my most favorite things to do is to organize the Instructors' Workshop at Dayton. The teachers and instructors who attend this workshop are on the frontline of recruiting and motivating children and adults about amateur radio. It's always a learning experience for me to share information with the folks in the audience as well as with the impressive guest speakers.

My "Cuz"

Sheilah Perry NØUOP from Bloomfield, Missouri, has been sharing her wisdom with me for many years. We call each other "cuz" because of the rapport we've established and because of the sharing of our last names. Sheilah won the 1993 ARRL Instructor of The Year award because of her many outstanding achievements. She must surely be the all time champ at getting grants and raising money for her radio program. She gave us some great tips and encouraged those who were interested to contact her for a copy of her "Do's and Don't's of Grant Writing." Among some of her tips are: always write everything in layman's terms, and get someone else to read your grant before you submit it. Sheilah is a terrific resource person for suggestions on how to raise money for your program.

"Phasing in The Classroom"

Bob Heil K9EID from Fairview, Illinois was our next speaker. Bob was the 1982 Dayton Ham of The Year and has authored

hundreds of articles and four textbooks in the field of audio and amateur radio. His down-to-earth and easy to read writing style make his books appropriate for classroom use. The audience watched with delight as Bob demonstrated how to teach "Phasing in The Classroom." Making concepts and electronic principles exciting to the audience was exactly what we all wanted to see.

Get Young Adults into Radio

My next speaker was Bill Pasternak WA6ITF, who was the 1989 Dayton Ham of The Year. Bill is also the producer of Amateur Radio Newline, and is the creator of "The Young Ham of The Year" award. Each year one youngster is chosen to receive the award at the Huntsville, Alabama, Radio Convention. The award is cosponsored by Yaesu USA and CQ magazine. Bill stressed that the main purpose of the award is to encourage young adults to get actively involved in amateur radio and to make contributions to it. If you know of any enthusiastic and accomplished youngsters in our hobby, be sure to pass the information along to Bill or me. Through the years, he and I have been compiling quite a list of terrific amateurs under the age of 18.

School to School

Missy Hollenbeck AAØOF, from Andover Middle School in Kansas, spoke about using amateur radio effectively in the classroom. She should know! We've been communicating school-to-school on the radio



Photo A. Bob Heil K9EID did a great job demonstrating "Phasing in the Classroom."



Photo B. Missy Hollenbeck AAØOF has been communicating with Carole's school on the air this past year.

this past year. Several of the youngsters are presently in a pen pal exchange as well. Missy really hit the highlights of some of the exciting things she does with the children in her radio program. Field Day and balloon launches were graphically shown to the audience by way of wonderful posters her children had made. Missy is the kind of teacher who can really make a radio program exciting and fun for her classes. The following day at HamVention, Missy did an outstanding presentation at my Youth Forum with three of her students: Sarah Hill AAØTN, John Dolecek KBØLHG, and Donovan Metcalf NØUYW. They were simply terrific.

Wear Your Uniform!

Jeff Savasta KB4JKL, from New York, has been a ham radio friend of mine for many years. He is a police officer in Suffolk County and is one of the founders of

SPARC, Suffolk Police Amateur Radio Club. Jeff has been a guest speaker at my school several times and always made a great impression on the kids in my radio classes. On one visit he got to deliver the same talk to six different classes in a row. Welcome to the world of teaching in an intermediate school. Jeff's talk was about how to use police officers as effective speakers in a ham radio class. By now we've learned all the tricks to keep the kids interested. Coming in uniform and using some professional police training videos makes a big difference.

Make It Fun!

All the speakers at the Instructors' Workshop made wonderful suggestions and contributions. The overall theme of what everyone had to say was: Make it be fun and exciting to learn; a hobby is for enjoyment! RF

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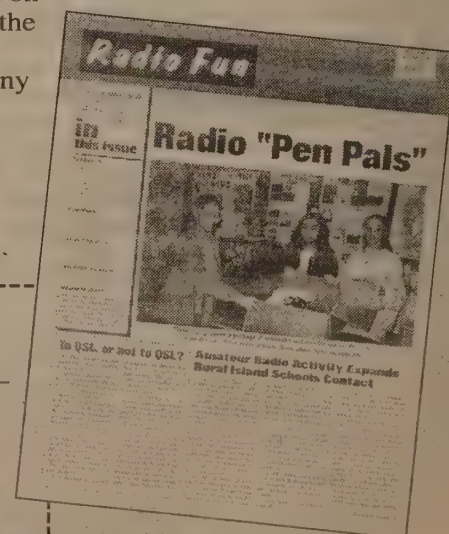
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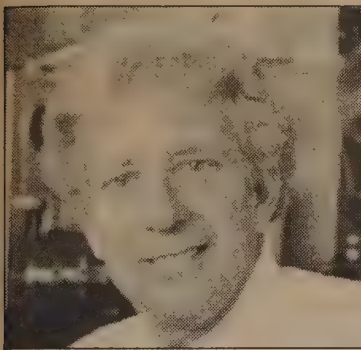
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upgrade . . . don't stop now

by Gordon West WB6NOA

Scanning Beyond Hams

Your new amateur radio mobile or hand-held transceiver may have an undocumented feature that will add considerably more enjoyment to your radio operating. The feature is "out of band" reception, and it is 100 percent legal as long as you don't reveal what you have heard on frequencies outside of ham bands, and you never, *never* tune into telephone calls or signals specifically covered by the Electronic Communications Privacy Act: 1) encrypted or scrambled signals, 2) paid subsidiary carrier authorization, 3) remote broadcast of studio/transmitter links, 4) voice paging or mobile/marine/aeronautical phone calls.

Except for these forbidden signals, anything else that may come across your little hand-held or mobile VHF/UHF set is fair game to monitor: fire and paramedics; national weather channels; marine radio channels; search and rescue frequencies; land mobile radio channels; police, sheriff, and highway patrol; aeronautical channels; taxi, railroad, and motor carrier channels; FBI, Air Force 1, DEA, and CIA frequencies.

Where to Listen

Almost all amateur radio 2 meter hand-held and mobile radio equipment can tune well above and well below the 2 meter ham band limits from 144 MHz to 148 MHz. This could allow aircraft radio reception from 110 MHz to 130 MHz, satellite reception around 137 MHz, the FBI near 140 MHz, land mobile from 150 MHz to 154 MHz (including fire and police), marine radio at 156 MHz, and weather channels up at 162 MHz.

If your amateur radio set has dual-band capabilities for the 70 cm 440 MHz band, or if you have a UHF (only) ham set, the out-of-band excitement begins just above the ham band limits at 450 MHz. Between 450 MHz and 460 MHz are hundreds of land mobile radio services, including land mobile radio, business band, taxi radio, tow trucks, and just about any other type of agency that uses a relatively short 4-inch whip antenna on the cab of their vehicle. From 460 to 470 MHz is where you'll find metropolitan police departments, fire, rescue, paramedics, ambulance and hospital communications, and even telemetry channels where you can hear someone's heart beat as they are being raced to the emergency room. If ever you are looking for

a sequel to what's on television, tune around 460 MHz for the excitement!

Which Sets to Use

Does your new ham set or VHF/UHF have out-of-band capabilities? You can tell by reading over the specification sheets. The spec sheet will usually call out for amateur transmit from 144 to 148 MHz, and for 30 MHz to 450 MHz. They will then list the receive capabilities, many times spelling out 110 MHz-130 MHz in the AM mode for aircraft reception, and 130 MHz-170 MHz for FM reception for both ham and out-of-band monitoring.

On early model ham sets, the instruction manual gives you a step-by-step program to unlock the receiver for out-of-band reception. This was usually accomplished by holding down a couple of keys, and turning the equipment off and on again. You sometimes had to have an extra set of hands to accomplish this! Newer ham sets for 140 MHz and 440 MHz have the out-of-band reception already enabled by the factory so no further keystrokes

are required. To find out whether or not your set is capable of easily tuning out of band, simply scan down from 144.1 and see whether or not you get into 143 MHz, 142 MHz, etc. Then try scanning up from 148 MHz, and watch the set go into the 150 MHz region, and hopefully well into the 160 MHz region so you can pick up the 24-hour weather broadcasts.

When you scan below 130 MHz, you may hear a different sound in audio reception. This is your ham set switching from FM over to AM to detect aeronautical channels that carry AM (amplitude modulation) emissions. The aircraft band is one of the last holdouts of AM. All other frequencies and services on both VHF and

UHF use exclusively FM (frequency modulation), the same type of emission that your ham set was originally designed for.

Your amateur radio transceiver will specifically lock out any transmit capabilities beyond the 144-148 MHz 2 meter ham band limits, and will also preclude you from transmitting below 430 MHz or above 450 MHz on your 70 cm ham band limits. Your reception capabilities are within the law of monitoring the airwaves—and because your set won't transmit beyond ham band limits, you are within the law of possessing a piece of equipment specifically designed for ham operators. However, going inside that ham set and cutting a diode or two to unlock the transmit inhibit is specifically illegal, and never would you ever consider transmitting beyond ham radio band limits unless speci-

cally authorized by Civil Air Patrol, MARS, or the United States Coast Guard.

Certain dual-band hand-held transceivers manufactured prior to January 1, 1995, may also have capabilities to tune in 300 MHz and 800 MHz frequencies. The 300 MHz band will probably not have much activity, except for some military communications around military bases. But up on 800 MHz, you might try scanning around 857 MHz to pick up public safety calls from police, medical, fire, and ambulance. However, restrict your scanning to only this area around 857 MHz because eavesdropping on cellular telephone frequencies around 870 MHz is a rule violation of the Electronic Communications Privacy Act. I don't want you reading this publication in jail. Ask a friend who has a similar radio how to "double up" on the 440 MHz band to achieve 800 MHz reception. Some sets have it, and some don't.

Radio Shack makes both VHF and UHF handhelds, as well as a 2 meter mobile, and the Radio Shack sets specifically tune to only ham band limits. You cannot achieve out-of-band reception on Radio Shack equipment because of their unique tuning to ham-only frequencies. Their ham-only frequency coverage offers a boost in selectivity when tuning in the ham bands, but unfortunately for the scanner enthusiast, the set won't budge beyond the ham band limits. But all is not lost with a Radio Shack ham set—companies like MFJ and GRE offer convert-

ers that attach to the outside jack of the ham set and bring in those out-of-band frequencies you would not normally be able to tune in.

If you haven't purchased your ham set yet, pay particular attention to the out-of-band receive capabilities it may or may not have. Ask the dealer specifically how high and how low your new VHF/UHF ham set might go on receive. They will tell you! It's no longer a big secret like it was a few years ago when manufacturers kept mum about what their sets could do on receive. Now that the rules have been clarified, there is absolutely no violation in getting full use out of your VHF/UHF ham set as if it were a fully programmable scanner. Most 144 MHz/440 MHz ham sets have this capability, so why not take advantage of it?

Stop by Radio Shack and pick up a scanner book that lists all of the neat exciting frequencies in your particular area of the country. Program them into your ham set's memory, and then do a little searching with the keypads to see what else you might find that's exciting out there on the airwaves. I bet it will be several hours before you put your radio down when you get caught up in a police chase, an aircraft in trouble, a boat sinking, or the FBI out there on a bust. Remember, keep everything you hear absolutely confidential and to yourself when you are scanning outside of ham band limits. It's for your ears only, so enjoy!

RF

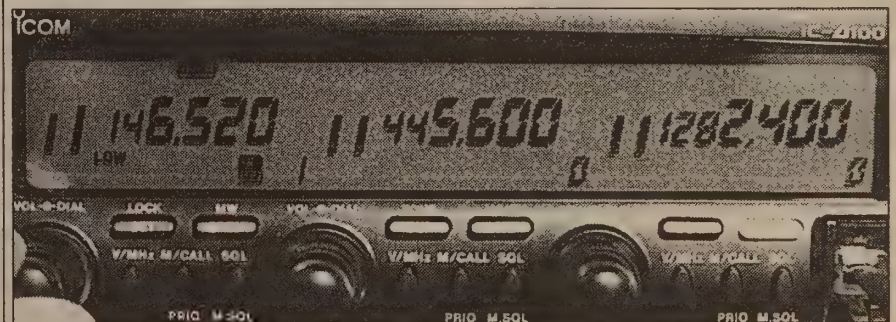
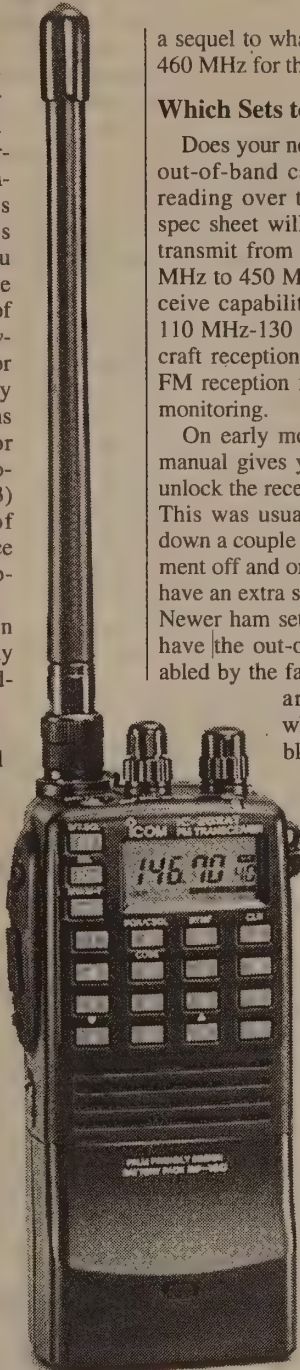


Photo B. This Icom tri-band mobile rig offers wideband receive on 110-170 MHz AM and FM, 400-510 MHz FM, and 1200 MHz-1300 MHz FM.

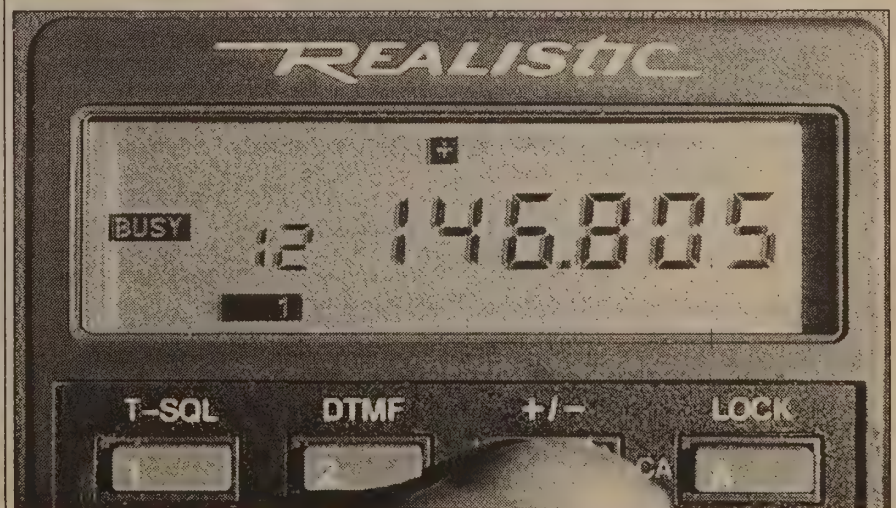


Photo C. Radio Shack's 2 meter radios specifically tune only 144-148 MHz. They will not tune out of band.

HF Skywave Propagation

Continued from page 20

guarantee you'll arrive at work safely in your car, but knowing the route and the general conditions on the way will help you considerably in having a successful trip! That's pretty much the bottom line: Knowing driving conditions or knowing propagation conditions can serve you by allowing you to make intelligent choices in both of those activities.

You may want to re-read this information several times to make it part of your conscious thinking when operating the bands; it normally takes awhile before it becomes second nature. Also, keep in mind what I mentioned earlier, that even the experts don't agree on everything when it comes to propagation theory, because it is just that, a *theory* or our best guess as to how the mystery really unfolds! Future discoveries may alter some of the concepts we now hold to be true, and that's an area in

which perhaps some of us can make a difference. It may very well be that we know less about HF propagation than the current wisdom on the topic presupposes. There are still mountains to climb and frontiers to tame.

So, you might want to begin listening to WWV at 18 minutes after the hour, and copying W1AW's bulletins whenever you can. With all of our contributions, little by little the radio propagation "mystery" will become less mysterious. **RF**

Further Information About HF Skywave Propagation

The Ionospheric Layers

The *D layer* is basically an absorptive layer. It absorbs all frequencies, but will normally not allow frequencies below about 3 MHz to penetrate it. Fortunately, the D layer only exists during daytime hours. It forms rapidly at sunup at a height of about 35 miles and dissipates rapidly right after sundown. It's the reason that some commercial AM broadcast stations must either shut down completely at sundown, reduce power, or change antenna patterns. Once the D layer disappears, ionospheric skip is likely even as low as the AM broadcast band.

The *E layer* is a reflective layer for signals within the 3 to 8 MHz range and is the main propagation layer for these frequencies during daylight hours. It resides at a height of about 70 miles. The E layer density is reduced during the night, but still does exist to varying degrees at all hours.

The F1 and F2 Layers

The *F1 layer* may be as low as 140 miles above the earth, while the *F2 layer* forms at about 250 miles up. The F2 layer is mainly responsible for long-distance communications for frequencies above about 8 MHz, both during daylight hours and into the night. At some point during the night, the F1 layer combines with the F2 layer to form the *F layer* at an intermediate height of about 200 miles above the earth. Thus, during periods of darkness, only two layers exist: a considerably less dense E layer, and the merged F layer. At some point after sunrise, the F layer again separates into the F1 and F2 layers, and all four layers (F1, F2, D and E) begin increasing in density once again. It's also possible to experience ducting between (within) the F1 and F2 layers—i.e., signals bouncing between these two layers—for some indeterminate distance. That phenomenon can open up areas not normally accessible by "normal" skip distance predictions.

The *Sporadic E Layer* is a very dense patch of highly ionized particles that appears only at times, in relatively small patches, and at about the same height as the normal E layer. It's been associated with both intense thunderstorm activity and wind-shear at the upper altitudes of the atmosphere. It's very sporadic (occasional) in its development, but when and if it forms, it can support interesting long-distance communications paths as high as the amateur 2 meter band, though normally its effects are seen primarily only on our 6 meter and 10 meter bands.

There are other propagational possibilities, other than those mentioned, but these are the most commonly encountered means of long-distance communications.

Ionospheric Frequency Selectivity

MUF (the Maximum Usable Frequency) is the highest possible frequency that can sustain communications between two specific areas on the earth's surface. The MUF will be usually—but not always—highest at midday, and also highest during the 11-year sunspot cycle peaks; it can exceed 50 MHz during those sunspot cycle peaks.

The *Critical Frequency* is the highest frequency that will be

reflected from the ionosphere from a signal that's sent straight up toward the ionospheric layers. It may be as low as 2 MHz at night or as high as 13 MHz during midday. It's a good measure of the relative density of the ionization of the ionosphere. Frequencies transmitted at an angle other than straight up, however, can be of considerably higher frequencies than the Critical Frequency, and still be reflected or refracted by the ionosphere. So the Maximum Usable Frequency is normally higher than the Critical Frequency. That's because signals arriving at an angle are easier to reflect than those coming from directly below. It's fairly safe to assume, then, that the *angle of incidence* with the ionosphere can be an important factor in determining the Maximum Usable Frequency at any particular time. This is why you've probably heard that the *angle of radiation* from an antenna in the HF bands can be an important consideration. Vertical antennas usually have a lower angle of radiation, and horizontal antennas (beams or wire antennas) must be quite high off the ground for lower take-off angles.

OWF (the Optimum Working Frequency) is usually about 15% below the Maximum Usable Frequency for communica-

tions between any two specific areas. It's the frequency that sustains the *least amount of absorption* by the ionosphere for a particular path. As the frequency is raised beyond the Optimum Working Frequency, we soon pass through the Maximum Usable Frequency, and propagation

disappears. As the frequency is lowered from the Optimum Usable Frequency, ionospheric absorption progressively increases until the path is no longer usable. It's an unfortunate fact that every ionospheric layer that a signal passes through absorbs some of the energy contained in our signals, and some is even absorbed in the layer that's reflecting our signal! The *LUF (Lowest Usable Frequency)* is therefore the frequency where incoming noise covers up the readability of a signal of a particular frequency. This can vary with the location of the receiving site and is partly dependent upon background atmospheric noise and local static at that particular site.

Interestingly, the Optimum Working Frequency phenomenon is the reason that signals above 14 MHz will often dramatically increase in strength just before the band is about to fade out. The band is going through the Optimum Working Frequency (as signals improve) and then passes through the Maximum Usable Frequency (as signals disappear) a short time later.

The Maximum Usable Frequency is different at different points in the 11-year solar cycle: During a sunspot cycle peak period, the MUF may vary from greater than 50 MHz during daylight hours to under 5 MHz during periods of darkness. During a sunspot cycle minimum, the MUF varies much less dramatically, going from perhaps 15 MHz during daylight hours down to only 10 MHz during periods of darkness.

It's interesting to note that the MUF may actually be higher at night during a sunspot cycle ebb than when the cycle is at its peak.

Sporadic-"E"

Continued from page 19

speech signals on the radio band, talking with a distinctive accent different from those in your location, or talking about things that you normally don't hear on the bands.

For scanner listeners, you'll begin to pick up police calls and fire calls up to 800 miles away. No-code Technician class ham operators will begin to easily work FM and SSB communications on 6 meters, and sometimes get some rather rare double-hop, short-skip conditions leading to coast-to-coast contacts. And when 6 meter contacts get as close as 400 miles, start listening to 2 meter band openings. They will last only a few minutes, so talk quick!

Bits of Fun from Nature's Quirks

July, August, and September are always the best months for sporadic-E. Whether you're a ham or a scanner listener, join in on this excitement that usually occurs in the evening hours when you have a few hours to enjoy some tricks that Mother Nature will play on the ionosphere. And if you're located north of 38 degrees latitude, take a peek outside and see whether there is an aurora, too. **RF**

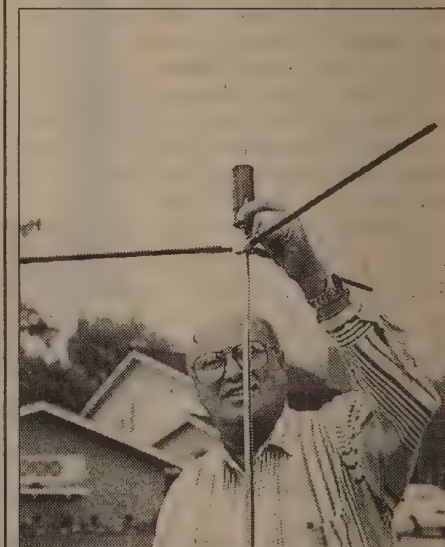


Photo E. Dr. Joel Levy WQ6E adjusts his 6 meter mobile resonator for 6 meter mobile fun!



Photo F. John Connell KJ6JY gets set for 6 meter mobile E-skip contacts.

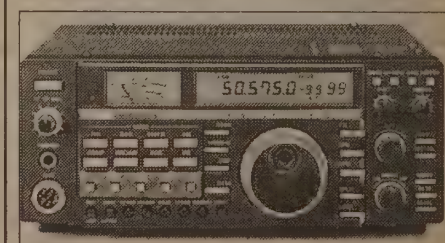


Photo G. Powerful 6 meter base station can easily work skip when conditions are just right on both FM and SSB.

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

JULY 8

PETOSKEY, MI The Straits Area ARC will sponsor a Swap & Shop, 8 AM-1 PM, in the 4-H Bldg. at Emmet County Fairgrounds. Talk-in on 146.68. For info, call *Harry Leiber N8OIV*, (616) 347-6610.

SALISBURY, NC The North Carolina "Alligator Group" will sponsor a "Firecracker Hamfest," 8 AM-2 PM at the Salisbury Civic Center. Auction at 1 PM. VE Exams at 1:30 PM, pre-reg. required, with 610, copy of license, and current fee sent to *Isabell Ledford, P.O. Box 826, Cooleme NC 27014*. For Hamfest reg., write to *Walter "Alligator" Bastow, 3045 High Rock Rd., Gold Hill NC 28071*.

SOUTH MILWAUKEE, WI The 26th annual "Swapfest" of the South Milwaukee ARC, Inc., will be held at the American Legion Post #434 grounds, 9327 S. Shepard Ave., Oak Creek WI, 7 AM-2 PM CDT. Talk-in on 146.52 simplex and on local Rptr. For a free flyer, write to *The South Milwaukee ARC Inc., P.O. Box 102, South Milwaukee WI 53172-0102*. Tel. (414) 762-3235.

JULY 8-9

INDIANAPOLIS, IN The Indianapolis Hamfest Assn. will host the ARRL Central Div. Convention, and a Ham Radio/Electronics Flea Market, at the Marion County Fairgrounds. K9YJW will provide Talk-in, from 6 AM each morning, on 146.76(-) and 443.25(+). Contact *Indianapolis Hamfest Assn., P.O. Box 88677, Indianapolis, IN 46208*. Tel. (317) 251-4407.

JULY 9

BALTIMORE, MD The Baltimore Radio Amateur TV Soc. will hold its annual Maryland Hamfest/Computer Fest at the Maryland State Fairgrounds in Timonium. Vendor setup 2 PM Sat., July 8th. Tailgating area opens 6 AM, Sun. Buildings open 8 AM. VE Exams at 10 AM only. Pre-reg. required. Call *Les McClure W3GXT*, (410) 833-8667. Talk-in on 147.03/R and 224.96/R. For info, contact *BRATS Hamfest, P.O. Box 5915, Baltimore MD 21208*. Tel./FAX (410) 467-4634.

HINSDALE, IL Dupage ARC Hamfest Computer Show '95 will be held at Santa Fe Park, 91st and Wolf Rd. Commercial and Flea Market Set-up 6 AM. Hamfest hours 8 AM-3 PM. No VE Exams. Talk-in on the DARC 2M 145.250. Contact *Edwin Weinstein, 7511 Walnut Ave., Woodridge IL 60517*. Tel. (708) 985-0527. Send SASE with check payable to DARC, Hamfest '95, 7511 Walnut Ave., Woodridge IL 60517.

PITTSBURGH, PA The North Hills ARC will hold their 10th annual Hamfest 8 AM-3 PM at the Northland Public Library, 300 Cumberland Rd. Talk-in on 149.69/.09 North Hills ARC Rptr. Contact *Gregg Corsello K3QK, 2021 Red Coach Rd., Allison Park PA 15101*. Tel. (412) 366-7006.

JULY 15

NEWPORT, NH The Newport Chamber of Commerce will host the Sugar River Amateur Radio Festival, 8 AM-3 PM, at the Town Common in Newport. VE Exams, Craft Fair, HF/VHF Demos. Talk-in on 146.76. For Craft Fair info, call *Dawn Cummings K1TQY*, (603) 352-7077. For more info regarding Ham Radio events, call *Rob Boyd N1CIR*, (603) 863-5383.

JULY 15-16

MISSION, BC, CANADA Maple Ridge, Mission and Abbotsford ARCs will present the 2nd annual AREP Expo and Ham/Computer Swap Meet, 9 AM-4 PM, at Mission Rec Center,

7th and Talbot St. Setup at 8 AM. For info, write to *MRARC, 32750 Cherry Ave., Mission BC V2V 2T7, Canada*. For table reservations, call *Rob VE7JOK*, (604) 826-8445; *Terry VE7TAG*, 465-5710; *Steve VE7IIF*, (604) 826-8445; or *Fraser VE7OAB*, (604) 826-7020.

JULY 16

NEWTON, NJ The Sussex County ARC will hold its 17th annual Hamfest at the Sussex County Fairgrounds, Plains Rd., Augusta NJ, starting at 8 AM. Talk-in on 147.30/R, 224.50/R, and 146.52 simplex. Contact *Daniel Carter N2ERH, 8 Carter Ln., Branchville NJ 07826*. Tel. (201) 948-6999.

VAN WERT, OH Van Wert County Fairgrounds, US 127 South, is the location for "Hamfest '95," which will be held in the Commercial Bldg. by the Van Wert ARC, 8 AM-3 PM. Talk-in on 146.850. VE Exams if you can pre-register by July 9th; send SASE or call *Bob High KA8IBF*, 12838 Tomlinson Rd., Rockford OH 45882. Tel. (419) 795-5763. For Hamfest info, call *Bob High*, (419) 795-5763 before 5 PM; *Bob WD8LPY*, (419) 238-1877 after 5 PM.

WASHINGTON, MO The Zero-Beaters ARC will hold its 33rd annual Hamfest at Washington City Park. Gates open at 6 AM. Registration for VE Exams will start at 9 AM. Talk-in on 147.240(+). Contact *ZBARC, P.O. Box 24, Dutow MO 63342*; or call *Dave Randolph N0GLN*, days, (314) 532-2477; eves. (314) 764-4999.

JULY 21

NEWINGTON, CT The 14th Annual ARRL Digital Comm. Conf. will be held Sept. 8-10, 1995, at the La Quinta Conf. Center in Arlington TX. Anyone interested in digital communications is invited to submit a paper for publication in the *Conference Proceedings*. Presentation at the Conference is not required for publication. Papers are due by July 21st, and should be submitted to *Mary Weinberg, ARRL, 225 Main St., Newington CT 06111 USA*; or via Internet at *lweinberg@arrl.org*. Please contact Mary for detailed format requirements. For more info on the Conference, registration, and hotel reservations, contact *TAPR, 8987-309 E. Tanque Verde Rd. #337, Tucson AZ 85749-9399, USA*. Tel. (817) 383-0000. FAX (817) 566-2544. Internet: *tapr@tapr.org*.

JULY 21-23

PHOENIX, AZ The ARCA Ft. Tuthill Hamfest will be held at Coconino County Fairgrounds, Flagstaff AZ. Contact the *Amateur Radio Council of Arizona*, (602) 440-2039, for reservation info. VE Exams Sat. July 22nd, at 8:30 AM. No-code Tech class - contact *Morgan Riley N7DLW*, (602) 938-4356.

JULY 23

FREDERICK, MD The Mid-Atlantic DX & Rptr. Assn. will hold a Hamfest at the Marc Train Station in Brunswick, Frederick Cty., Md. VE Exams. Flea Market. Brunswick Train Museum. Tent/Indoor spaces must be pre-reg.; write to *MADRA Hamfest '95, 230 N. Potomac St., Hagerstown MD 21740*. Talk-in on 147.060/448.125 MHz Rptrs.

JULY 27-29

COLORADO SPRINGS, CO The Central States VHF Soc. Annual Conference will be held at the Sheraton Colorado Springs Hotel, 2886 South Circle Dr. For Hotel Reservations, call (719) 576-5900, or (800) 325-3535. Be sure to ask for the Central States VHF Soc. rate. For Conference info, contact *Lauren Libby KX00*, (719) 593-9861; or *Hal Bergeson WOMXY*, (719) 471-0238. E-Mail to 75151.2442@COM-

PUSERVE.COM (KX00) or *BERGESON @PPCC.COLORADO.EDU (WOMXY)*. A special "Youth Program" for young hams, and beginners in VHF (regardless of age) will be offered on Fri. morning.

JULY 28-29

OKLAHOMA CITY, OK The Central Oklahoma Radio Amateurs will sponsor their 22nd annual "Ham Holidays '95" at the Oklahoma State Fair Park (Hobbies, Arts & Crafts Bldg.). Doors open 5 PM-8 PM, Fri., July 28th; 8 AM-5 PM, Sat., July 29th. Technical and non-technical programs, Fox Hunt, VE Exams, Flea Market. Talk-in on 146.67. Address all inquiries to *Ham Holidays '95, P.O. 851281, Yukon OK 73085-1281*; or *CompuServe 75672,3475*.

JULY 29

ASHEVILLE, NC The 20th annual Western Carolina Hamfest will be held 8 AM-4 PM at the Haywood County Fairgrounds, near Waynesville NC. Sponsor: Western Carolina ARS. Talk-in on 146.16/.76 and 146.31/.91. Contact *Tommy Queen K4BNP, 12 Lynwood Circle, Asheville NC 28806*. Tel. (704) 258-2639.

CARLINVILLE, IL Macoupin County ARC, Inc. will hold their Computer Fair/Hamfest '95 at the Macoupin County Fairgrounds, 1/2 mi. north of Carlinville, on Rte 4, starting at 8 AM. Setup the night before or at 6 AM. Vendors, contact *Doug KA9HDZ* at (618) 488-7249. VE Exams, all classes, pre-reg. required. Call (217) 854-8261. For info, call *Dennis N9LQC*, (217) 854-2365.

KINGSFORD, MI The Mich-A-Con ARC will host the Upper Peninsula Hamfest in the Iron Mountain-Kingsford area at the United Sportsman Club in Merriman MI, starting at 8 AM. Setup at 7 AM, CST. Contact *William Bertoldi, Jr. KB8SBP, 709 Hamilton Ave., Kingsford MI 49801*. Tel. (906) 774-0419; or *Lou Gembolis KG8NK, 441 Balsam, Kingsford MI 49801*. Tel. (906) 774-2930.

JULY 30

SACRAMENTO, CA The River City ARCS Ham Radio Swap Meet and Picnic will be held at the California State U. Sacramento Parking Lot A, 8 AM-Noon. Talk-in on 145.250(-) CTCSS 162.2 Hz. Contact *Troy Baker KD6HOJ*, (916) 725-8152; or email *johna@clsels.com*.

XENIA, OH Xenia Hamfest/Computer Expo will be held at Heartland Flea Market, corner of Allison and Dayton Ave., 8 AM-3 PM. Contact *High Noon Trading Co., 4230 Dayton-Xenia Rd., Suite 500, Beaver Creek OH 45432-180*. Tel. (513) 429-5403.

AUG 5

CLAYTON, NY The Jefferson County RAC, will hold their Hamfest 7 AM-5 PM, at the Clayton Rec. Park Arena. VE Exams at 9 AM; walk-ins welcomed. Talk-in on 146.70/.10. Contact *Jefferson County RAC, P.O. Box 523, Brownville NY 13615*.

RIVERDALE, NJ The Split Rock/West Morris Radio Clubs will hold the annual North Jersey Hamfest at the National Guard Armory on Newark Pompton Trnprk. Contact *Bernie WB2YOK, Fax/Voice (201) 584-5399, 24 hrs.*, or *Steve KF2TI*, on line, *KF2TI@AOL.COM*.

AUG 6

ANGOLA, IN The annual Land of Lakes Angola Hamfest, sponsored by the Land of Lakes ARC, will be held 7 AM-2 PM at Steuben County 4-H Fairgrounds, corner of 200 W & 200 N, at Crooked Lake in Angola. Vendor setup 3-10 PM Sat., Aug. 5th; 4AM-7 AM Sun., Aug. 6th. VE Exams for all classes; sign up at 9 AM. Chicken BBQ. Talk-in on 147.180/.780 and 444.350/449.350 131.8 Tone. For Tickets, please contact *Land of Lakes Angola Hamfest, Sharon Brown WD9DSP, 905 W Parkway Dr., Pleasant Lake IN 46779*. Tel. (219) 475-5897.

MARSHFIELD, WI The Marshfield Area ARS will hold their 4th annual Picnic, beginning around 11 AM in Wildwood Park. Potluck. Swapfest. Talk-in on 147.180. All are welcome. Contact *Guy A. Boucher KF9XX, 107 West Third St., Marshfield WI 54449*. Tel. (715) 384-4323. Packet: *KF9XX @ W9IHW.WI.USA.NA*.

PEOTONE, IL A Hamfest/Computer Festival will be held at Will County Fairgrounds 6 AM-?, by the Hamfesters RC, Inc. Setup Sat. Aug. 5th 3 PM-11 PM. The main exhibition hall opens at 8 AM. Contact *John Fleming, 13800 Division St., Lot 215, Blue Island IL 60406*. Tel. (708) 489-5872.

SPECIAL EVENT STATIONS

JULY 1-2

BOSTON, MA The Boston ARC will operate a Special Event Station aboard the WWII destroyer USS Cassin Young, docked in historic Charlestown Navy Yard. With help from the National Park Service, which gives guided tours of the ship, they will be celebrating the Boston Harborfest. There will be a message booth so visitors can send radiogram greetings to friends and family. Operation will be HF and VHF on or about 7230, 14.230, 21.330, 28.330 and 146.520, at 1500Z-2000Z. Work the Cassin Young and get a special photo QSL card, or come see us in person!

JULY 4

WILLIAMSBURG, VA The Williamsburg Area ARC will operate KE4YVV 1300Z-2300Z, to celebrate the 219th Anniversary of the signing of the Declaration of Independence. Freq: 28.350, 24.950, 21.350, 18.150, 14.270, 7.270 and 3.870. For an unfolded certificate, send QSL and a 9" x 12" SASE to *Hershel Kreis KE4GWV, 145 Sand Hill Rd., Williamsburg VA 23188-6609*.

JULY 8

SIoux FALLS, SD The Sioux Empire ARC will operate W0ZWY 1400Z-2200Z to commemorate the U.S.S. South Dakota BB 57 (WWII Battleship X) 50th Nat'l Reunion. Operation will be on CW and phone on the 80-10 meter bands. For a QSL certificate, send QSL and SASE to *SEARC, P.O. Box 91, Sioux Falls SD 57101*.

SOUTH POINT, OH The Lawrence County OH AR Emergency Services group will operate the Lawrence County OH Ohio River AR "River Days" Special Event Station WN8F, from aboard the Jewell City Sternwheeler. The event will run 11 AM-4 PM. Freq. 2M 146.715 & 146.610 Linked; 10M 28.400; 20M 14.240; 40M 7.240. Packet will also be on display and operating. Brochures about amateur radio and emergency services will be available to the public. Also, visitors will be encouraged to send a message to a friend Via Ham Radio.

JULY 9

WESTERN NEW YORK The ATV Group of Western NY will launch its second High Altitude Helium Balloon at 9 AM. Live video may be received on 439.25 MHz, 2M CW beacon on 144.34, and local 40M net, starting at 8:30 AM on 7.290 MHz +/- QRM. Overlay on video will display the call sign of WA2CXW, along with altitude, temp., and other info. For details, call *Roger Garbacz WA2CXW*, (716) 937-4478.

JULY 13-15

SACRAMENTO, CA The Sacramento ARC will operate W6AK 8 AM-8 PM Pacific Daylight Time, to celebrate the Folsom Powerhouse Centennial. Operation will be voice on 10, 15, 20, 40 and 80 meters. The 10, 40, and 80 bands will probably be used the most. A special Centennial QSL Card will be sent to stations worked that send an SASE to *The Sacramento ARC, P.O. Box 161903, Sacramento CA 95816-1903*.

JULY 15-16

PLYMOUTH, MA The Mayflower ARC will operate KB1BQJ from the waterfront "Harborfest," 1400Z-2100Z, in honor of the 375th Anniversary of the landing of the Pilgrims at Plymouth Rock. Operation will be in the General portion of the 40, 20, 15, and 10 meter bands. For a certificate, send SASE to *MARC, P.O. Box 766, Plymouth MA 02362-0766*.

KINGSPORT, TN The Bays Mountain Radio Club and the Kingsport ARC will operate W4ZJA 1700Z-2400Z on July 15th and 16th, to commemorate the 75th Anniversary of their sponsor, Eastman Chemical Company. Operations will be on the General portion of the 40 and 20 meter phone bands, and the Novice portion of the 10 meter subband. For a certificate, send a QSL and a 9" x 12" SASE, along with your contact number, to *W4ZJA, Bays Mountain Radio Club, P.O. Box 3168, Kingsport TN 37664*.

JULY 15 & 22

RACINE, WI The Racine Megacycle Club will operate club station W9UDU to celebrate the 21st Anniversary of the largest Lake Michigan fishing contest, "The Big One," Salmon-A-Rama, July 15th and 22nd, from 1500Z-1900Z. Operation will be on the lower 25 kHz of the General 20 and 40M phone/CW bands, and 28.400 MHz. Contact may also be made on 147.27(+) (Lakeshore Rptr). Packet operators may connect with W9UDU @K9RRS.EN62GK.WI.USA.NOAM; Subject: Salmon-A-Rama; Text: Finish the sentence: Fishing Lake Michigan is great because... For a certificate, send your QSL and an SASE to the *Racine Megacycle Club W9UDU, Box 3, Racine WI 53401-0003*.

JULY 16

SOCORRO, NM The Socorro ARA will operate NA5N from 1100-1700 UTC, from near Ground Zero - Trinity Site - in the Central New Mexico desert, to commemorate the 50th Anniversary of the world's first atomic bomb test. Listen on the General phone and CW portions of the 80, 40, 20, 15, and 10-meter bands (depending on propagation). A QRP station will operate in the QRP frequencies of 7.040, 14.060, 21.060

and 28.060 MHz. For a QSL/Certificate, send QSL and business size SASE to *Socorro ARA, Trinity Site Event, P.O. Box 522, Socorro NM 87801*. Trinity Site will be open to the public the morning of July 16th. The White Sands Missile Range Stallion Gate (east of San Antonio NM) will be open to the public 5 AM-11 AM MDT. On July 15th, the Nat'l Radio Astronomy Observatory will offer guided tours of the Very Large Array radio telescope, west of Socorro. For info and accommodations, contact the *Socorro County Chamber of Commerce, P.O. Box 743, Socorro NM. Tel. (505) 835-0424*.

JULY 17-22

LAPORTE, IN Members of the LaPorte ARC will operate K9JSI, 1500 UTC-0400 UTC, to celebrate the Sesquicentennial of the LaPorte County Fair. Operation will be on HF in the General portion of the 75, 40, 20, 15, 10 meter phone bands. For QSL, send QSL and #10 SASE to *LaPorte Radio Club, P.O. Box 30, LaPorte IN 46350*.

JULY 20-23

COLORADO SPRINGS, CO The International Tesla Soc. will operate KC2Q/0, 1600Z-2400Z, daily, on 7.297, 14.297, 21.397, and 28.397. KC2Q/0 will QSL directly to YOU.

JULY 22-23

STRATFORD, NY The-Fulton County Mahlon Loomis Committee will operate W2ZZJ, 1300Z-2000Z, each day, on the General class phone portion of 40, 20, and 15 meters, and on the Novice 10 meter phone band; also, on area 2 meter FM Rptrs. This is to celebrate the 169th Anniversary of the birth of Dr. Mahlon Loomis, the American wireless telegraphy pioneer. For a certificate and literature, send QSL, contact number, and #10 SASE to *W2ZZJ, 5738 STHWY 29A, Stratford NY 13470*.

JULY 27-30

OSHKOSH, WI Fox Cities ARC will operate W9ZL at "Pioneer Airport" (adjacent to the EAA Aviation Museum), in conjunction with the Experimental Aircraft Assn. Fly-In and Convention. Operations will be on the General phone portions of the HF bands, as well as RTTY and CW, as conditions permit. Talk-in (no QSLs) on

146.520 simplex. Send QSL and 9" x 12" SASE to *Wayne Pennings WD9FLJ, 913 N. Mason, Appleton WI 54914*.

JULY 27-AUG 2

GREENVILLE, NC The following stations will operate during a DXpedition to St. Paul Island (CY9): Ron AA4VK/CY9; Murray WA4DAN/CY9; Bob KW2P/CY9; Vance W5IJU/CY9. Operation will be on all bands 160M-6M. Modes: SSB, CW, and RTTY. QSL via *Murray D. Adams WA4DAN, 403 East 14th St., Greenville NC 27858*.

JULY 28-AUG 2

PICTOU ISLAND The West Island ARC of Montreal, will celebrate the 100th Anniversary of the first successful attempt to solo around-the-world by solo sailboat expedition, by operating XJ1CW1 during a DXpedition to Pictou Island in the Northumberland Strait. Freq: 1,835; 3510; 3795; 7050; 7250; 10,110; 14,040; 14,195; 18,080; 18,120; 21,040; 221,320; RS-12 Tx 21,220; Rx 29,420; RTTY 7090; 14090; 14,090; VHF 144.3 MHz (SSB) 50.11 SSB. Operators: Reg VE2AYU, Lowell VY20X, Fred VE2SEI, Helen VE2YAK, Al VO1NO, Al VE2DAV, Ben VE3ISN, Jeff VE2TBH, and Vicki, soon to be VE1???. Helen VE2YAK will be looking especially for YLs. Address QSLs to the *West Island ARC Inc., P.O. Box 884, Pointe Claire/Dorval, Quebec H9R 4Z6, Canada*. Address inquiries to *Fred Archibald VE2SEI, 130 Embleton Crescent, Pointe Claire QC H9R 3N2, Canada*. Or, tel. (514) 694-3441; Fax (514) 630-4134.

JULY 29

EAST GREENWICH, RI The Fidelity ARC will operate K1NQG 1300Z-1800Z, to coincide with the annual Yankee Tune Up at the New England Wireless and Steam Museum. Phone: lower portion of the 20 meter General subband; CW: the Novice portion of the 40 meter band. For a certificate, send QSL and SASE to *Bill May N1LEJ, 20 Montana Ave., Coventry RI 02816*.

JULY 29-30

RUTLEDGE, TN The Lakeway ARC will operate KS4QK 1400Z-2300Z in conjunction with the Grainger County Tomato Festival. Op-

eration will be in the middle of the General 20, 15, and 10 meter Novice phone subbands, and 146.50 2 meter. For a certificate, send \$1, a 6" x 9" SASE, and your QSL card to *Perry R. Hensley, R#3 Box 566A, Rutledge TN 37861-9300*.

AUG 4-6

LANNON, WI Members of the Milwaukee ARES will operate W9WK to celebrate the 5th annual "Picnic Ham" held at Menomonee Park. Operation will be in the General phone and CW bands on 75, 40, 20, 15, and 10 meters. For a certificate, send QSL and a 9" x 12" envelope (with 2 units of postage) to *W9WK, c/o John Leekly, 757 N. Broadway, Suite 306, Milwaukee WI 53202*.

AUG 5

GRAND TRAVERSE BAY, MI The Cherryland ARC will operate K18W 1400Z-2359Z, from Marion Island in West Grand Traverse Bay, for their "Islands of the Great Lakes' 95 Expedition." Operation will be between 7220 to 7230 kHz SSB, and 7030 kHz CW. For a certificate, send QSL and 9" x 12" SASE to *Brian Cox WA8QAF, P.O. Box 119, Acme MI 49610-0119*.

ROCHESTER, NY The AUXHAMS, the U.S. Coast Guard Auxiliary AR Operators, will operate WA2RXE, 1400Z-2000Z, to celebrate the Birthday of the US Coast Guard. Operation will be in the lower General phone portions of the 80, 40, 20, and 15 meter bands, the Novice 10 meter subband, and 146.925 Rptr. For an unfolded certificate, send QSL and 9" x 12" SASE to *AUXHAMS, WA2RXE, P.O. Box 90411, Rochester NY 14609*.

AUG 5-6

BARNEGAT LIGHT, NJ The Old Barney ARC will celebrate National Lighthouse Day by operating W2OB from the Barnegat Lighthouse on Long Beach Island (IOTA NA-111). Operation will be 1200 UTC-2300 UTC both days. Freq: 146.52 simplex, 146.835 Rptr., and other area Rptrs. QSL via *Joe Fleishinger NU2F, 75 Joshua Dr., Manahawkin NJ 08050*. Include either an SASE, for QSL only, or a 9" x 12" SASE with 2 units of postage, for a certificate and a QSL. **RF**

PRB-1 Protection for NH Hams

New Hampshire Section Manager Al Shuman N1FIK recently issued a bulletin announcing that a bill to provide PRB-1 protection for NH Hams has passed both houses of the NH Legislature and has been forwarded to Governor Steven Merrill, who is expected to sign the bill into law.

Basically, HB 379 states that cities, towns, and counties shall not adopt or amend zoning with respect to antennas used for Amateur radio that fails to conform to the limited Amateur Radio Preemption 101 FCC 2nd 952 (1985).

With the signing of this bill into law, New Hampshire will join Florida, Washington state, and West Virginia as the only states in the Union affording such protection for amateurs.

For more details, contact Al Shuman N1FIK at (603) 487-3333. *TNX M.A.R.C., Inc. News, May 1995*.

Amateur Database Via Internet: Complete FCC Files Available Daily.

The Federal Communications Commission is now offering the complete amateur service database on the Internet, via the FCC's file transfer protocol (ftp) site. Information may be retrieved using anonymous ftp

to ftp.fcc.gov. The compressed database files are located in the directory "pub/XFS_AlphaTest/amateur."

The database consists of two portions: the entire data base, which is refreshed each week by noon Monday, and daily transaction files. The transaction files are named for the day of the week (mon.zip, tue.zip, etc.) and are available nightly.

Approximate file sizes are: Full database 32 Mbytes zipped, 144 Mbytes unzipped; Transactions 4-10 Kbytes zipped; 6-50 Kbytes unzipped.

All files are zipped and each line of data ends in a carriage return/linefeed. It has been reported that downloading the full data base took 7 hours using a 14.4 Kbps modem and cost under \$20 using Prodigy.

The FCC's Consumer Staff in Gettysburg, Pennsylvania, can answer questions at (800) 322-1117 or (717) 337-1212. Or send any questions, comments, or complaints to mkemper@fcc.gov.

If you despair of trying to download this huge database, there is hope. The Amateur Radio Club at the University of Arkansas at Little Rock has already implemented an Internet callsign server that makes use of the FCC database. They update their server daily, making this the best source for license information outside of the FCC itself. The World Wide Web reference for the UALR Callsign server is <http://www.ualr.edu/doc/hamualr/callsign.html>. *TNX Nashua Area Radio Club Bulletin*.

Surfin' the 'Net

For those of you with WWW (World Wide Web) capability the Contest DXpedition Register is now available at <http://www.mordor.com/wb2k>.

This will allow anyone instant access to view the planned DX-peditions for the next 12-18 months. This information is obtained from Larry K3TLX (keeper of the E-mail version), and any additional information gleaned from DX publications, bulletins, and the packet cluster. *TNX NOARS Log..*

A Northridge Earthquake Aftershock Shakes Los Angeles County Hams in a Good Way.

Today the Los Angeles County Board of Supervisors passed a very favorable antenna tower ordinance with help from county hams.

The Tri-County Amateur Radio Association, Los Angeles Council of Amateur Radio Clubs, ARRL officials, and County Disaster Communications personnel worked with the Los Angeles County Planning Department to rewrite the building code regarding ham radio antennas and towers. Prior to the Northridge earthquake the code would allow roof-mounted towers over 35 feet tall, but would not allow ground-mounted towers over 35 feet without a costly vari-

ance (over \$3,000). Tri-County's Antenna Ordinance Committee had proposed changing the code before the earthquake, but progress was slow. Soon after the disaster, the county realized how beneficial ham radio was and that changes to the code could prevent a possible earthquake hazard; therefore, progress on the new ordinance gained momentum.

The new ordinance contains the following provisions: A basic building permit is all that is required for a ground-mounted, retractable tower that is 75 feet maximum height (including mast) when extended, and retracts below 35 feet when not in use. It must be motorized and have a manual back-up mechanism for lowering. The ham is also allowed one vertical antenna over 35 feet tall. No permit is needed for any antennas less than 35 feet in height.

If the tower does not meet the requirements, the ham can apply for an "Amateur Radio Antenna Permit" which costs about \$317 and is a form of variance. Any person who wishes to contest the variance must pay about \$282 for a planning review, which would help stop frivolous objections to the variance.

If you need more information, please call Walt Bacon N6SMT, Chairman of the Tri-County Amateur Radio Association Antenna Ordinance Committee, at (909) 599-5574. *TNX Tri-County Amateur Radio Association Press Release*. **RF**

What You Missed in 73 Amateur Radio Today

If you don't read the July issue of *73 Amateur Radio Today*, here is some of what you're missing:

- Want nifty pictures of your own weather from the sky? You need a "Dish Antenna for Weather Satellite Images." Don't dish out big bucks! Jim Kocsis WA9PYH tells you how to build your own 5-foot parabolic dish for 1691 MHz.

- And Jim wouldn't just leave you with the problem of weak weather satellite sig-

nals. He guides you through putting together "A Low Noise Amplifier for 1691 MHz."

- Who needs radio more than sailors? Do it right: read "Sailing with Ham and Marine Radio Equipment" by Gordon West WB6NOA. "Gordo" will tell you how you can carry these systems aboard without permanent installation.

- If you do a lot of FM voice and packet, you'll want to know what Marty Gammel KA0NAN says about an omnidirectional an-

tenna you can build with 6 dB of gain for under \$10. The "2 Meter Collinear Vertical Antenna" will show you how.

- What the heck is a Bel, anyway, and why do we use a tenth of it for a unit? All you need to know about this sometimes confusing topic is in "A Decibel Primer" from Steven R. Sampson N5OWK. Now, you can nod knowingly when those old hams talk about "6 dB gain."

- A high-speed, home-brew "DTMF Decoder" is just what Richard Taylor K7CAH needs to input and keep track of over 600 user and control codes to deal with his local repeaters. Richard gives you the schematic to build it and the BASIC program to run it on your 286 or better.

- Snagging pictures from the air is a breeze with a computer—if you have a "Pasokon TV Slow-Scan TV Interface." Michael J.

Geier reviews the hardware/software product that promises SSTV for everyone!

- Need a small yagi for a foxhunt or emergency station? Peter H. Putman checks out a pair of lightweight VHF/UHF yagis in "Maldol Antenna's HS-FOX2 and HS-FOX75." They're backpacker delights at a pound or under, and good directional gain.

- You've also missed our regular monthly columns on radio direction finding, radioteletype, VHF/UHF/microwave, low power (QRP), questions and answers, hints, and more.

You should read the July issue, and *every* issue of *73 Amateur Radio Today*! Order now and save over \$22 off the cover price. You'll receive a one-year subscription (12 issues in all) to the best ham magazine money can buy, for just \$24.97. For instant service call toll-free (800) 289-0388. Do it now!

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What Does It Take

...to get you to subscribe to 73? Sure, we could give you a lot of history to show how 73 has had a powerful influence on ham radio as it is today. But what you want to know is what can 73 do for you right now.

1) One of the most fun parts of hamming is buying a new piece of gear and using it. But you sure want to know all you can about it before buying, right? 73 has more equipment reviews than any other ham rag, and almost always has 'em first.

2) Unless you're a real nerd, you want to know how to get

active on packet, the ham satellites,

slow-scan, and all the other exciting adventures amateur radio has waiting for you. 73 has been the leader in new ham modes ever since it started. And Wayne was doing the same thing when he started *Amateur Radio Frontiers* magazine in 1951. He was pushing ham teletype then. Still is, for that matter. Then, as the editor of *CQ* for five years, he pushed SSB and NFM. Then, after being fired because *CQ* owed him too much money, he started 73, where his long editorials have been urging hams to try new things, learn more, and be entrepreneurs, since 1960. Wayne's editorials have helped hundreds of hams become millionaires.

3) One of the more fun things in hamming is building gadgets. 73 has more simple construction projects than the other ham rags combined. Plus lots of reviews of kits. You'll have a ball with some of the QRP rigs and kits.

4) Antennas? You'll read about a ton of new ideas in antennas. Here's one area of hamming that you can experiment with and have fun.

5) Wayne's done just about everything there is to do in hamming, and he generally helped pioneer new modes. He's visited over 130 countries and operated from over half of them. He went on his first DXpedition in 1958 to Navassa as KC4AF. Almost got killed. So when he writes his editorials urging you to try something new, he's usually done it himself.

6) Once you start reading his editorials you'll be hounding the flea markets for back issues. With over

a thousand of his provocative, and often controversial, editorials published so far, that'll keep you busy for a while. Wayne sure says what he thinks. But he does his homework first, so the chances are that if you don't agree with him, it may be you who needs to do the homework, not him. Wayne predicted the cellular telephone industry before it happened. He did the same with microcomputers, starting the first magazine in the field, and then with compact discs, again with a magazine. He's into cold fusion now with a new magazine. It costs \$98 a year for a subscription, so you'll probably cry poverty and miss the next huge industry that's about to get started, and miss out on being a millionaire again. Tsk. But that's the price for being chintzy.

7) Speaking of chintzy, you might enjoy reading about Wayne's travels. He calls it being thrifty. He's written several of these travelogs with the day-to-day stories of his trips. You'll enjoy them. Check the Uncle Wayne's Bookshelf ad for details. You could do worse than read his *Declare War* book too. Thousands of hams have read and enjoyed it.

8) Meanwhile, at least read 73 so you can keep up with what's happening.

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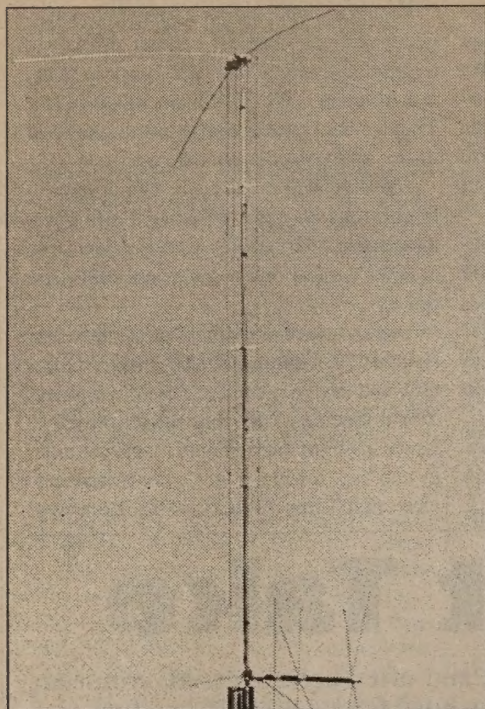
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new products



MFJ ENTERPRISES, INC.

MFJ Enterprises, Inc. announces the MFJ-1798 "10" Band Antenna, offering ten bands with only one antenna and featuring a very low radiation angle, fully automatic bandswitching, omnidirectional coverage, low SWR, and a full 1,500 watts PEP SSB power handling. Self-supporting and only 20 feet tall, the MFJ-1798 is exceptionally strong as a result of its solid fiberglass rod and large-diameter, 6061T-6 aircraft-strength aluminum tubing. It also has a unique Elevated Top Feed that puts the maximum radiation point high up into the sky, operates with end loading, and is easy to tune.

The MFJ-1798 is priced at \$269.95. For more information or to order, contact any MFJ dealer or *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762; (601) 323-5869, FAX (601) 323-6551, or order toll-free at (800)-647-1800. Or circle Reader Service No. 202.*

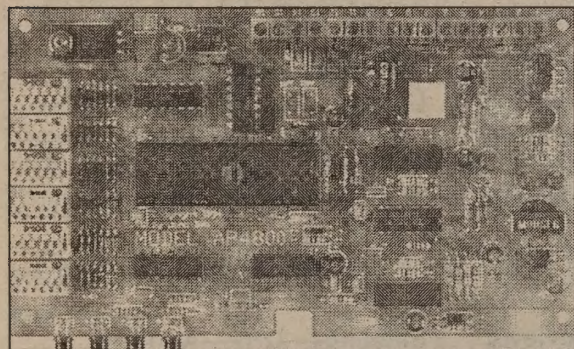
JOHN BELL

John Bell has introduced a low-cost repeater controller with a phone autopatch that is controlled by DTMF tones. It uses the Intel 8749 microcontroller. A complete repeater can be made by connecting a receiver, transmitter, antenna system, 12-volt

power supply, and a phone line. No additional boards are needed. The antenna system can be two separate antennas or one antenna with a duplexer. It features the following: DTMF Controlled Autopatch and four control lines, selectable rejection of long-distance calls, VOX or COR operation,

two courtesy tones controlled by an input line that can be used to detect power failure, or connected to one of the four control outputs or a jumper. CW identification call sign is switch selectable. The board is 3.6"x 6.3".

The AP4800 board is \$99.95 plus \$6 S&H. For more information contact *John Bell, 1381 Saratoga St., Minden, NV 89423; (702) 267-2704. Or circle Reader Service No. 207.*

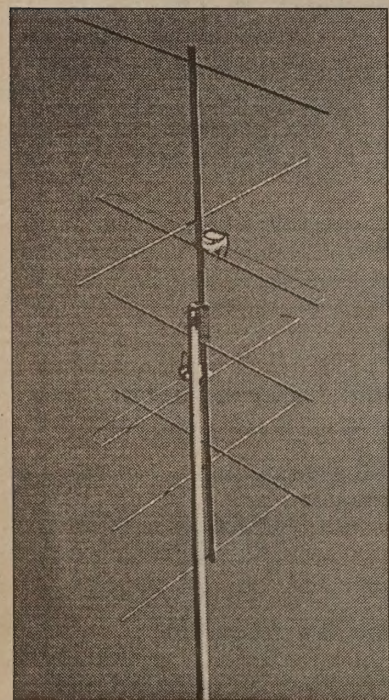


WOODHOUSE COMMUNICATION

Woodhouse Communication has introduced a new line of specialty VHF antennas. Amateur band antennas for 144, 220, and 440 MHz offer extremely heavy-duty construction using 1" OD, thick-wall booms, and solid 3/8" rod elements. All components are 6061-T6 aluminum, with 100% stainless steel hardware. A unique matching transformer and conservative antenna design provide full band coverage with low SWR and good pattern response. Various models offer replaceable baluns, and the ability to upgrade at a later time. All models feature rear mount with supplied brackets.

For polar orbital weather satellite reception, the APT-4X4 is specifically designed for 137-MHz circular polarized use. The same heavy-duty construction is used in this one-of-a-kind antenna for NOAA and MET APT imaging. Selective frequency operation and good gain figures provide clean, noise-free images on passes as low as 9° maximum elevation, providing a total east/west viewing range of up to 4,000 miles.

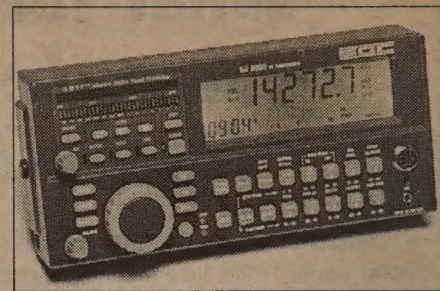
Custom antennas for other services are also available. For information or product guide, contact *Woodhouse Communication, P.O. Box 73, Plainview, MI 49080-0073; (616) 226-8873, FAX (616) 226-9073. Or circle Reader Service No. 203.*



SGC, INC.

SGC, Inc. has introduced the PowerTalk ADSP-SNS Control Head for the SG-2000 or SG-2000SP transceiver. PowerTalk incorporates adaptive digital signal processing and spectral noise subtraction to provide unsurpassed signal quality on the HF bands, with user-friendly operation via LED indicators.

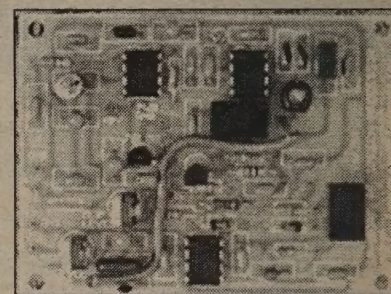
The PowerTalk ADSP reduces unwanted noise. In addition, the operator can adjust the frequency range by means of Upper and Lower Corner frequency controls, and can then adjust the center frequency up or down via the spinner knob control, resulting in clear signal quality. The SNS feature subtracts noise in the spectrum where voice modulation is not present, further enhancing the signal. A notch filter feature allows up to five tones to be suppressed simultaneously, and user memory (eight preset and seven user-programmable) allows the operator to configure the frequency and mode he wants for ease of operation. Surface-mount technology ensures reliability in any environ-



ment.

The PowerTalk control head is designed to operate with the SG-2000 or SG-000SP transceiver. The SG-200 series of SSB radiotelephones are 150 watts and 644 channels and operate in the 1.6 to 30 MHz range.

The introductory price for the SG-2000 PowerTalk is \$2,495. For additional information or to receive a brochure on this new product, contact *SGC, Inc., P.O. Box 3526, Bellevue, WA 98009; (800) 259-7331, FAX (206)-746-6384. Or circle Reader Service No. 208.*



COMMUNICATIONS EQUIPMENT COMPANY

From Australia comes the CEC model SP-500 RF Speech Processor Plus, designed to help achieve maximum performance from SSB radio equipment. It can provide an 8-dB increase in a signal's readability under weak and noisy reception conditions, having the same effect as more than quadrupling your transmitter output power. The SP-500 incorporates such features as multimode "E/K" End of Transmission Beep (ETB) generator, LED bargraph level indicator or bypass switching to allow for "with" and "without" comparison tests. The SP-500 RF is priced at US\$210 plus freight from Australia.

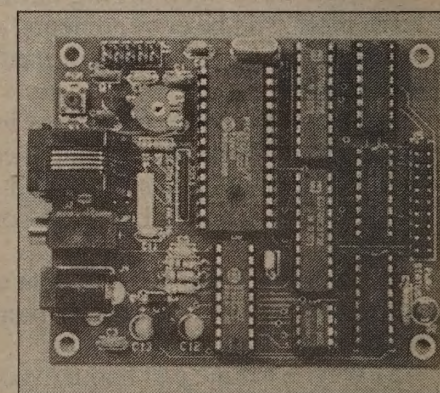
Using circuitry similar to the SP-500, the little SP-100 RF also packs as much punch. Both units bring the amplitude of the low-

level component up close to that of the peaks, thereby decreasing the average-to-peak power ratio. Because they do this at RF, using their own internally generated SSB signal, they produce a much cleaner output waveform and more talk power than any audio processor or power amplifier microphone. With the SP-100, however, installation is simplified by the fact that it connects in series with the microphone's audio line. The SP-100 RF is priced at US\$75 plus freight from Australia. For more information or to purchase either item, contact *GFS Electronics, P.O. Box 97, Mitcham, 3132, Victoria, Australia; phone 61-3-9873-3777 or FAX 61-3-9872-4550. Or circle Reader Service No. 204.*

MOTRON ELECTRONICS

The Auto-Kall AK-16 is the newest member of the MoTron Auto-Kall product line. It is a DTMF controller with 16 relay driver outputs, DTMF-to-X-10 home control, CWID, and Morse response tones. A relay board with screw terminal blocks, sold separately, can directly mate to the AK-16 for easy set-up.

All 256 X-10 house/unit codes can be addressed, letting you control lights, appliances, gates, etc., with the DTMF keypad on a hand-held or mobile radio. You can also configure outputs for several different modes of operation. One mode makes it possible to control easily the pan/tilt focus/zoom functions of a remote video camera and also provides latching outputs for controlling transmitters, lights, etc. The AK-16 can be configured with a Morse response after each output is turned on or off, or triggered momentarily, assuring you that the command was received and executed. You can also program the 0- to 12-digit



security code and 32-character CW ID using a DTMF keypad. The AK-16 furthermore has a serial output that converts incoming DTMF to ASCII for input into your computer.

The AK-16 is sold as a fully assembled circuit board. The price is \$99 and is available from *MoTron Electronics at (800) 338-9058, FAX (503) 687-2492. Or circle Reader Service No. 206.*

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

TAB4354 **The Beginner's Handbook of Amateur Radio, Third Edition** by *Clay Laster W5ZPV*. 395 pages. Wonderful book for newcomers. It is basic and well illustrated. Even if you have all the other ham handbooks, you'll still find this one useful. **\$22.00**

W5GWCN **Technician Class License Manual: New No-Code** by *Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **\$9.95**

XTAL-1 **The Crystal Set Handbook** by *Phil Anderson W0XI*. Want to give a kid an exciting present? Or maybe yourself? Crystal sets are alive and fun. Here's a whole book packed with crystal set circuits that anyone can build. Now start saving those oatmeal boxes, okay? 133 pages **\$10.95**

AR4432 **W1FB's Help for New Hams** by *Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **\$10.00**

AR4920 **Introduction to Radio Frequency Design** In this practical book, the author emphasizes use of models and their application to both linear and nonlinear circuits, reviews traditional material stressing the viewpoints taken by the RF designer and illustrates subject material by numerical examples. Includes 3 1/2 inch disk for IBM PC or compatibles. **\$30.00**

WAYNE WRITES

WG1 **We The People Declare War On Our Lousy Government—**360p soft cover. This is Wayne's report explaining what the major problems are facing both New Hampshire and the country, and proposing simple, inexpensive solutions: a simple way to have government departments happily cut their expenses by 50% within three years; how to cut the cost of incarcerating prisoners by over 90%; how to end welfare; how to reduce the deficit; how to cut medical costs and improve health care; how to cut school costs and improve schools. An absolute seal at \$13.

WG4 **20/20 Foresight—**Twenty 16p updates on the **Declare War** book—320p. Further proposals for solving critical American problems, such as a new approach to financing small businesses, how to finance Russia and other countries and make a profit doing it, the real dope on bioelectromagnetics, a new kind of polytechnical university, a new electronics technology, why Africa is in such a mess, why Perot bombed, how to have tuition-free universities, a plan for making Congress turn honest, etc. Plenty more. Ridiculously priced at \$10.

WG5 **Submarine Life in WWII—**60p. Wayne's story of his adventures on the USS Drum SS-228 on five war patrols in the Pacific in 1943-45. What's it really like on a submarine when you're being depth charged? And what's the day-to-day life on a submarine like? Did you see the movie Das Boot? Exciting stuff and only \$7.50.

WG6 **Uncle Wayne's Caribbean Adventures—**96p. Wayne's adventures scuba diving all around the Caribbean, visiting ham operators, and sightseeing. If you're interested in how to travel economically, you'll get some great ideas from this. He starts out with his "Diving, the Wimp Sport." You'll love the visits to 11 islands in 21 days trip. A measly \$7.50.

WG7 **Uncle Wayne's Travels—**52p. Wayne travels to Russia, London, Aspen, St. Pierre, Munich, Vienna, Krakow, and Prague without it costing nearly as much as you might think. Cheap for you too, at \$5.00.

WG9 **Wayne Talks: 'Dayton'** 1995-90 minute tape-What he would have said if he'd been asked to speak. **\$5.00**

CODE TAPES

73T06 **"The Stickler"** \$5.95

6+ wpm—This is the practice tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are set at 13 wpm and spaced at 5 wpm.

73T13 **"Back Breaker"** \$5.95

13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steady-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous"** \$5.95

20+ wpm Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra Class license. We send the code faster than 20 per.

73T25 **"The Mind Boggler"** \$5.95

25+ wpm Fiendishly generated by kindly old Uncle Wayne for hams with a strong need for self punishment. Once you've conquered 25 per let Unk know if you need a 50 wpm tape.

UHF/VHF PACKET

ARTSCI **U.S.Repeater Mapbook** by *Robert Martin* The Guide for traveling radio amateurs. **\$9.95**

TP001 **The Basic Guide to VHF/UHF Ham Radio** by *Edward M. Noll* Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **\$6.95**

AR3959 **Your Packet Companion** Perfect for the packet newcomer. **\$8.00**

LAST CHANCE

SAM22567 **Mastering Packet Radio—The Hands-On Guide** Written for amateur radio enthusiasts, you'll discover what packet is and how it works, how to set up your own packet station, and other useful tips for newcomers and becoming a good 'packeteer' **\$12.95**

SAM22488 **IC User's Casebook A 'must'** for any hobbist's workshop, covers ideal operation amplifiers, inverting and noninverting followers, linear amplifiers, active filters, digital circuits and waveform generators and timers. **\$12.95**

SAM48441 **178 IC Designs & Applications** A comprehensive collection of linear developments for electronic design and basic applications. **\$12.95**

PCP5012 **Everyday Electronics Data Book** For the hobbyist, student, technician and engineer. An invaluable source of information of everyday relevance in the world of electronics. **\$18.00**

ARRL BOOKS

AR1995 **ARRL 1995 Handbook** (71st Ed.) Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more, **\$30.00**

AR1086-4 **ARRL Operating Manual** (4th Ed.) Information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF. **\$18.00**

AR3657 **QRP Notebook** by *Dave DeMaw W1FB* Presents construction projects for the QRP operator. **\$10.00**

AR3207 **W1FB's Design Notebook** by *Dave DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **\$10.00**

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **\$15.00**

AR4173 **Now You're Talking! All You Need To Get Your First Ham Radio License** (2nd Edition) A complete study guide for the Technician and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. **\$19.00**

AR4971 **ARRL Repeater Directory 1995-1996** 19,000+ listings with digipeaters, bandplans, CTCSS (PL(TM)) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24 GHz. **\$7.00**

AR3398 **The DXCC Companion** by *Jim Kearman KRIS* Spells out in simple, straightforward terms what you need to be a successful DXer. **\$8.00**

AR1250 **Log Book—**Spiral **\$3.50**

AR3177 **The ARRL Spread Spectrum Source Book.** From a deceptively simple beginning, a group of experimenters set out to develop first theoretical and later practical systems for spread spectrum communications. This book consists of articles, papers and government reports that document the process whereby amateur spread spectrum progressed from the drawing board to the airwaves. **\$20.00**

AR2960 **Transmission Line Transformers** (2nd Ed.) by *Dr. Jerry Sevick W2FMI* Practical designs and specific information on construction techniques and sources of material. **\$20.00**

AR3851 **Hints and Kinks** Ideas for setting up your gear for comfortable, efficient operation. **\$10.00**

ARRL **License Manuals** Complete FCC question pools with answers.

AR4181 **Technician Class** \$ 6.00

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AR3282 **Extra Class** \$ 8.00

AR3185 **The Satellite Experimenter's Handbook**, (2nd Ed.) by *Martin Davidoff K2UBC* Expanded and revised. Focusing on satellites built by and for the international radio amateur community. **\$20.00**

AR2030 **Your Gateway to Packet Radio** (2nd Ed.) Tells everything you need to know about this popular new mode. **\$12.00**

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AR3169 **QRP Classics** Compilation of ARRL publications on building receivers, transmitters, transceivers, accessories. **\$12.00**

AR4270 **FCC Rule Book** A must for every active radio amateur. **\$9.00**

AR0356 **Morse Code: The Essential Language** by *L. Peter Carron, Jr. W3DKV* Expanded and revised in its 2nd edition. How to handle distress calls heard not only on the hambands but on maritime and aircraft frequencies. **\$6.00**

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ARRL **4955 Packet: Speed, more Speed and Applications** A collection of advanced packet methods and activities from ARRL publications and other sources. **\$5.00**

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"SEEK YOU" by The Ham Band—The titles include "Always on the air", "On the Monday Evening Grayline", "Radio Widow", "The Trip to Dayton", "The Contest" and seven more. Ham radio CD includes experiences that radio hams go through. This is an extremely entertaining CD and will strike a chord with any radio ham, SWL or XYL—an ideal present! **SYCD \$15 SYTAPE \$10.**

NEW BOOK

GEI3579 **Final Quantum Revelations** Dr. Kiril Chukanov uses not only science but revelation to answer difficult and profound questions about physical reality and cosmic destiny. **\$34.95**

REFERENCE

RS-1 **The Amateur Radio Mail Order Catalog and Resource Directory, 4th Edition** is the most comprehensive source book for electronic parts, software, and equipment targeted at the radio amateur or serious electronic hobbyist anywhere! Plus a wealth of "value-added" reference material all in 262 pages. 4th Edition clearance at only **\$8.95.** (was \$16.00)

TAB2701 **Transmitter Hunting** by *Joseph Moell and Thomas Carle* Radio direction finding simplified. **\$19.95**

UE202 **RTTY Today** by *Dave Ingram* Modern guide to amateur radioteletype. **\$8.95**

TP002 **The World Ham Net Directory** by *Mike Witkowski* New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **\$9.50**

WGP87158 **1995 North American Callbook** The 1995 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **\$35.00**

MMH24 **Radio Handbook**, 23rd Ed. by *William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **\$39.95**

WGP1234 **1995 International Callbook** The new 1995 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **\$35.00**

WSGWNV **No-Code Video, Manual, Part 97 Rules** Learn how to be a ham radio operator. **\$29.95**

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AR3754 **Radio Frequency Interference—How to find it and fix it.** Interference problems are challenging, but curable. With the techniques in this book, you can help restore electronic peace in your neighborhood. **\$15.00**

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DOV76 **Second Level Basic Electronics** Prepared by the Bureau of Naval Personnel Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. **\$9.95**

20N096 **How To Read Schematics** (4th Ed.) by *Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **\$19.95**

WLSWOPC **Radio Operator's World Atlas** by *Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **\$17.95**

TAB37109 **Secrets of RF Circuit Design** by *Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. **\$21.95**

SOFTWARE

GGTE **Morse Tutor** From beginner to Extra Class. Code from 1 to over 100 words per minute. Standard or Farnsworth mode. Create your own drills. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles.

GG52/5 **Morse Tutor 5.25" Disk** **\$19.50**

GG31/2 **Morse Tutor 3.5" Disk** **\$19.50**

GGADV5 **Gold Edition 5.25" Disk** **\$29.95**

GGADV3 **Gold Edition 3.5" Disk** **\$29.95**

WSGWHO **Ham Operator Education Package Software.** Novice—Extra for PC's, contains both 3 1/2" and 5 1/4" disks. **\$39.95**

WSGWNW **No-Code Ham Radio Software Package for PC's**, contains both 3 1/2" and 5 1/4" disks. **\$29.95**

Lanze Code Programs—(Available on 5 1/4" * disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
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Tech	LZIBM02	N.A.**	\$14.95
General	LZIBM03	LZCOM03	\$14.95
Advance	LZIBM04	N.A.**	\$19.95
Extra	LZIBM05	LZCOM05	\$19.95

* Add \$2.00 for 3 1/2" disk.

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AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This book tells you how to get on the air using these techniques, and others, without calling attention to yourself. **\$8.00**

UE220 **The Easy Wire Antenna Handbook** by *Dave Ingram K4TWJ*. All of the needed dimensions for a full range of easy to build and erect "sky wires." **\$9.95**

WGP87034 **All About Cubical Quad Antennas** by *William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **\$11.95**

TAB 3270P **Practical Antenna Handbook—**Second Edition, 1994. Joseph Carr, Tab Books. This 360-page book is a real treasure. Starts with the fundamentals of antenna and feedline theory, explains about propagation of all kinds, and then provides a ton of easy antenna construction projects. Covers antennas and feeders for all bands. The explanations are simple and well illustrated, with some math, where it's unavoidable, but it won't bog you down. It even has the ZL-Special antenna, which I've used on 20m with some spectacular DXing success. A low angle of radiation and made it so I could always work the rare stuff first . . . Wayne. **\$26.95.**

AR4734 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **\$30.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization. **\$10.00**

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ARRL **4912 Antenna Compendium Vol. 4** You'll find 38 articles inside, covering a wide range of topics. There are simple, practical antenna projects, and there are heavy duty, theoretical treatments of complex arrays. Bundled inside is an IBM PC-compatible 3.5-inch, 720 KB disk. It contains executable programs and data. **\$20.00**

AR4661 **Antennas and Techniques for Low-Band DXing** can be your ticket to low-band success. Drawing on the experiences of successful DXers and the author's own considerable experience, John Devoldere, ON4UN, shares the tips and techniques that can make the difference between a station that takes part in a contest and one that wins it! **\$20.00**

AR3819 **Physical Design of Yagi Antennas** by *David B. Leeson W6QHS* provides the tools here to design and build robust Yagi antennas, using sound mechanical engineering principles. You need no longer fear the consequences of wind or ice storms on your antennas. With this information, you can build or "boef up" existing Yagis. **\$20.00**

AR2618 **W1FB's Antenna Notebook** by *Dave DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **\$10.00**

WGP87107 **All About Vertical Antennas** by *William Orr* Comprehensive coverage of amateur communications. **\$11.95**

WGP87042 **Beam Antenna Handbook** by *William Orr and Stuart Cowan* Everything you need to know about beam design, construction, and operation. **\$11.95**

WGP87077 **Simple, Low-Cost Wire Antennas For Radio Amateurs** by *William Orr and Stuart Cowan* All New! Low-cost, multi-band antennas; inexpensive beams, "Invisible" antennas for hams in "tough" locations! New data. **\$11.95**

AR2200 **Antenna Impedance Matching** by *Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **\$20.00**

AR0410 **Yagi Antenna Design** A *Ham Radio* series polished and expanded by Dr. Lawson. **\$15.00**

AR2995 **Reflections** will help dispel the half-truths and outright myths that many believe are true about transmission lines, standing waves, antenna matching reflected power and antenna tuners. **\$20.00**

AR3118 **Reflections—Software for IBM 5-1/4"** **\$10.00**

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Friend

Where Did "73" Come From?

How did hams get started using "73" as meaning "best regards?" It all seems to have started with the very first hams. Many of them had cut their teeth on the western land lines using Morse clickers. Out West a man's most prized possession was his Winchester 73 rifle, the "gun that opened the west." So it was natural for early telegraphers to "will their 73" at the end of messages. Soon they were just signing "73." And that's how come we hams got started using "73" and are still using it. CBers younger than their IQs, and obviously confused by numbers, sign with "sevens and threes."

Anyway, when I decided to start my own ham magazine in 1960, I looked for some term which was peculiar to hamming, and chose 73. When I started the first microcomputer magazine I went the same route, picking *Byte* for my title.

So here we are in 1995, 35 years after I started 73, and we're still going strong. This October will mark the 35th anniversary of my first issue. 420 issues! Not many magazines last that long. I got started in all this back in 1950, when I got interested in RTTY. The next thing I knew I was doing a monthly *Amateur Radio*

Frontiers magazine with 2000 paid subscribers, and then a column in *CQ* on the subject. When I got the *CQ* editor a better job at Popular Electronics in 1955 I suddenly found myself editing *CQ*. Five years later, after being fired, I decided to start my own ham magazine.

I couldn't find anyone willing to gamble with me, so I sold everything I could and got together just barely enough money to print the first issue. The saga of the next 35 years has been chronicled in my editorials. Well, I enjoyed John Campbell's (W2ZGU) editorials in *Analog* so much I decided to use the same approach. So I've been writing about anything I find of interest for 35 years, from aardvarks to B'ahai. The inventor of the contact lens was a ham I knew while I was living in Sarasota, and into B'ahai. Another Sarasota ham, who worked with me at WSPB, the local radio station, was Bandle Linn K8LAP, a cartoonist who did my first 73 cover and many more cartoons down through the years.

For more details on my life, you'll have to read my old editorials, or at least invest in some of the books and booklets I've written.

.....Wayne

Last Chance!

One of the most valuable resources you'll ever have in amateur radio is your ham magazine back issue collection. Any time you get interested in a new facet of the hobby, all you'll have to go on are the articles that have been published. This is why no ham ever throws out his old ham magazines. Ever!

Serendipitously, I was looking through our warehouse the other day and found that we had quite a bunch of back issues sitting there. They aren't of much use to us here, and they can be almost beyond value to you, so here's your opportunity to help me clean up a corner of the warehouse and for you to get a bunch of great back issues.

In addition to a gold mine of my old editorials, you'll also find reviews of equipment which could help you decide when you're shopping for a used rig. We publish more equipment reviews in 73 than any other ham rag. We also have more simple construction projects, and so on. I don't fill the magazine up with stale club news and the results of long-forgotten contests. Each issue of 73 is full of stuff still of current interest, even when the magazine is a few years old.

I've got 75 different back issues still on hand. While they last, you can stock up for a dollar each (each different, our choice), plus \$5 for shipping and handling. \$3 more if you prefer UPS. For \$55 ppd. you can get a stack of 50 back issues, which will keep you busy for weeks just reading my editorials. For \$35 ppd. I'll send you 25 back issues, and make you eat your heart out that you didn't send for the whole 75. By the time you find out that you've goofed and want to get the rest they'll be long gone. These are going to go fast.

No fair taking these to hamfests and selling them for \$2 each. Tsk, have you no shame? Clubs should stock up on bundles of 25 to give as a prize to any new hams they get licensed, thus giving them a head start on their ham libraries.

I don't have a ton of these, so they won't last long!

.....Wayne

Send this form or call 800-677-8838 or Fax 603-924-8613

- ☐ Yes, I want 75 back issues* of 73 for \$85.00 ppd.
- ☐ Yes, I want 50 back issues* of 73 for \$55.00 ppd.
- ☐ Yes, I want 25 back issues* of 73 for \$35.00 ppd.
- *each different--no choice
- ☐ Yes, I want UPS delivery add \$3.00

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- ☐ Yes, I want a 1 year 73 subscription for \$24.97. (Save 47% of cover price.)
Canada add \$8.40 postage and GST. Foreign add \$9 surface; \$42.00 airmail.
- ☐ Yes, I want both 73 and *Radio Fun* for \$30.00
Canada add \$16.10 postage and GST. Foreign add \$21 surface; \$78.00 airmail for both.

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